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THE ELEMENTS OF ANIMAL PHYSIOLOGY.

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CHAPTER I.

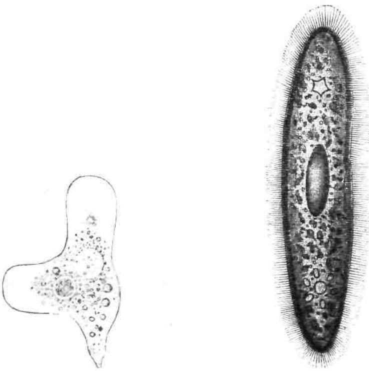
The Essentials of Life.

The best way to understand the working of a complex piece of machinery is to examine the earliest and simplest types. If we know, for instance, the principles on which Stephenson's *Rocket* was constructed we are in a fair way to understand the working of a modern locomotive. The same may be said of living things. The animals we designate by the term *mammalia* are the most complex and the most perfect of all living things, at least on this planet, and, therefore, before we can hope to understand what is known of the workings of their bodies we must first of all study the earlier and simpler types of life. Now, a frog is lower in the scale of life than a horse, but it is still high compared with the fish; whilst far below the fish we must place the worm. In this way we can go down the long ladder of living things until we come to a point where animals and vegetables meet, and below which there is no other form of life possible. This lowest, simplest, and oldest type of living thing is the SINGLE CELL.

There are very many varieties of such lowly developed creatures. For instance, the micro-organisms which enter our bodies and cause disease; some of these are plants, for instance, the bacteria of consumption, lock-jaw, and diphtheria; some are animals, such as the germ of malarial fever. Yeast belongs to this lowest class of life, and is looked on as a plant; a teaspoonful of yeast is really a vast horde of individuals, each composed of a single cell; also the microscopic creatures which may be seen to sparkle in the sea at night when the water is disturbed—these latter belong to the animal kingdom. But all these living things at the bottom of the ladder have this in common that each individual is composed of a single cell.

Structure of the Cell.

A cell consists of a body called the NUCLEUS, enclosed in a layer of substance called the PROTOPLASM. In most, if not all, cases, the protoplasm is lined on the outside by a thin covering called the CELL WALL. The nucleus is always a small body, and it so happens that the layer of protoplasm covering the nucleus can never be very much deeper than the width of the nucleus; hence it is that most living cells can only be seen under the microscope, and some of them only when high powers of magnification are employed; a very few may be seen by the naked eye, but they are never more than a few millimetres* in length. In contrast to this limitation in size, we find that the shapes which living cells display are unlimited. But in all cases there is a nucleus, and beyond the nucleus there is a protoplasm, and, we may further add, beyond the protoplasm is a watery fluid, either fresh water, sea water, or some watery solution.†



A B

Fig. 1.—(*a*) *Amœba* (magnified). An animalcule found in stagnant water. The dark body is the *nucleus*, and beside it is a pale *pulsating vacuole*, which, by altering its shape, keeps the protoplasm in movement. (*b*) *Paramæcium* (magnified). An animalcule found in water in which hay has been soaked. It has a well-marked *nucleus*, and two *pulsating vacuoles*. All round are tiny protoplasmic feet (*cilia*), which, by rapid movement, can propel the cell in any direction. (After Verworn.)

Protoplasm is neither solid nor fluid, as we usually understand by these terms; it rather resembles unboiled white of egg in consistency. When viewed under the microscope it presents a dotted appearance, as if delicate strands of firmer material were running in all directions through it, forming a meshwork. Here and there in the protoplasm are minute particles of substance which the cell is about to push outside, or is storing up for use as food. The nucleus is probably a little firmer than the protoplasm, but its structure is far more complex. In fact, a nucleus is an

* A millimetre = $\frac{1}{25}$th inch approximately.

† The term BIOPLASM will be used to denote both protoplasm and nuclear substance.

intricate mechanism rather than a simple substance, and it is in and around the nucleus that the greatest activities of the cell are manifest. Of the supreme importance of the nucleus many experiments give evidence. It has, for instance, been found possible in some of the larger single-celled creatures to tear off a portion of the protoplasm, and thus divide the cell into two parts, one with, and one without the nucleus. The unnucleated protoplasm continues to show some signs of life for a short time, but it has no power of repair or growth, and very soon dies. This is prettily shown with the *Polystomella*, a cell with a calcareous wall, which can be broken in the manner described. In the portion retaining the nucleus the

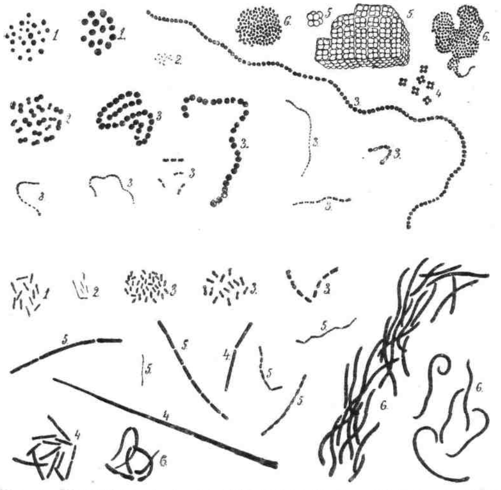


Fig. 2.—Illustrations of the manifold variety in size and form of different bacteria. (After P. Baumgarten.)

wound is speedily closed up with a new shell, and the cell's activities continue unabated; the unnucleated portion, however, goes rapidly to pieces, and is eaten up by other micro-organisms. We may lay it d wn then, as an all-important law in physiology, that, IF A CELL BE DIVIDED, THAT PORTION WHICH RETAINS THE NUCLEUS MAY LIVE, THAT PORTION WHICH IS CUT OFF FROM THE NUCLEUS MUST DIE.

Fundamental Characters of Life.

There are some characters common to all living things, both high and low, which may now be considered briefly:—

1. RENEWAL AND REPAIR.—It is essential to life that the different structures employed should be constantly renewed, not in large

portions at a time, but each part in a gradual manner. We are familiar with the mending and renewal of the parts of a machine, such as a bicycle; at one time a new tyre, at another a new spoke is added, until, as sometimes happens, no single part of the original structure is present. But if, instead of these parts being inserted complete and at separate times, the renewal was constantly being effected—if in every moment of the bicycle's existence each spoke and tube and screw was taking a minute amount of fresh material into itself, and throwing out a minute amount of old material, if the paint and rubber were not only replaced as soon as rubbed off, but were constantly being renewed in the same slow and continuous manner—

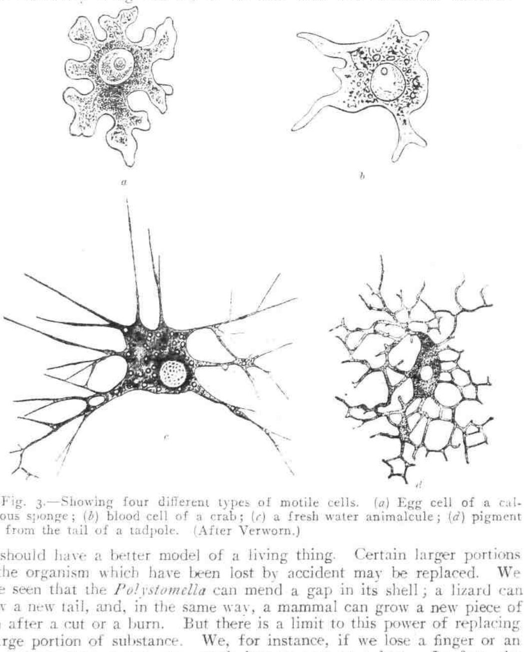


Fig. 3.—Showing four different types of motile cells. (*a*) Egg cell of a calcareous sponge; (*b*) blood cell of a crab; (*c*) a fresh water animalcule; (*d*) pigment cell from the tail of a tadpole. (After Verworn.)

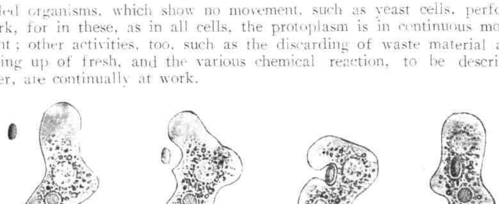
we should have a better model of a living thing. Certain larger portions of the organism which have been lost by accident may be replaced. We have seen that the *Polystomella* can mend a gap in its shell; a lizard can grow a new tail, and, in the same way, a mammal can grow a new piece of skin after a cut or a burn. But there is a limit to this power of replacing a large portion of substance. We, for instance, if we lose a finger or an eye, cannot grow a new one, much less an arm or a leg. In fact, the higher an animal is developed the less power it has to make good such losses; one reason being that in the higher animals the parts lost are far more complex than analogous portions of lower animals, so that, unfortunately, repair is out of the question.

Now, to enable the animal to keep this renewal and repair in progress, it is necessary that it should take up fresh material, in the shape of FOOD, and to eject old material in the form of EXCRETIONS.

2. ABSORPTION OF ENERGY AND PERFORMANCE OF WORK.—Most animals move their bodies about, chiefly to obtain food or to escape from danger, and in doing so perform work. Even those single-

Fig 4.—*Amœba* in eight successive stages of movement. (After Verworn.)

celled organisms, which show no movement, such as yeast cells, perform work, for in these, as in all cells, the protoplasm is in continuous movement; other activities, too, such as the discarding of waste material and taking up of fresh, and the various chemical reaction, to be described later, are continually at work.



a *b* *c* *d*

Fig. 5.—*Amœba* approaching and capturing a particle of food, in four successive stages. (After Verworn.)

Now, no work can be done unless energy is expended, and we have to consider whence the energy comes. We shall find that all the energy utilized by living things, both plant and animal, is derived from THE BREAKING DOWN OF COMPLEX UNSTABLE COMPOUNDS INTO SIMPLER AND MORE STABLE SUBSTANCES. For instance, the yeast plant takes up sugar, and splits it into alcohol and carbon dioxide. Now, experiment shows that the heat produced by burning a definite weight of sugar is greater than

the heat produced by burning that weight of alcohol, which would be derived from the sugar. The carbon dioxide cannot be burnt, it is at the bottom of the energy ladder. Now, this difference of heat between burning sugar and burning alcohol represents so much energy which the yeast plant can have at its disposal. Another instance is the lactic acid bacillus, which changes sugar into lactic acid. Here, too, if we burn some sugar and the corresponding weight of lactic acid, we find that the latter gives off less heat, and this difference means so much energy which the bacillus

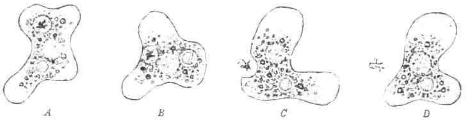


Fig. 6.—An *Amœba* in four successive stages of excretion of the undigested residue of food. (After Verworn.)

can use. But the quickest and one of the simplest methods of breaking down unstable bodies into stable, and so liberating energy is OXIDATION. A larval bee, for instance, eats sugar, but it is not content with a break-down into alcohol or lactic acid, it oxidizes the sugar completely into water and carbon dioxide, and thus gets all the energy possible. While, therefore, some plants and animals can live in the absence of oxygen, it is only the most lowly organized which can do so, as their energy requirements are small. Some plants can live with or without oxygen; a familiar

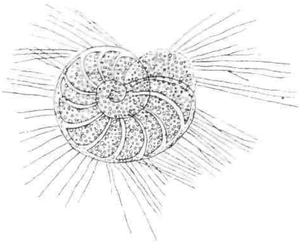


Fig. 7.—*Polystomella*, showing the shell and strands of protoplasm outside the shell. The nucleus is hidden by the shell. (After Schultze.)

example is *Mucor*, a mould which grows readily on jam. If *Mucor* be given oxygen it oxidizes the sugar to water and carbon dioxide, but if oxygen be denied it has to content itself with the same change which the yeast plant employs, that is, the splitting of sugar into alcohol and carbon dioxide, though much more sugar will have to be broken down to obtain a definite amount of energy than if oxidation were brought into play. All the higher plants and animals obtain most of their energy by oxidation, though non-oxidative changes can also be employed to a slight extent.

But all the energy obtained, whether due to oxidative or non-oxidative change, cannot be transformed into work. This is a well-known law in physics, and it tells us that only a fraction can be so utilized. Coal is a complex, unstable body, and when oxidized (burnt) gives out energy, but very few steam engines turn more than 15 per cent. of this energy into work, the rest appears as heat, which warms the machinery and escapes into the air. The living animal in the same way can only turn a fraction of the energy into work; in the case of the human body about 22 per cent. is so converted, the rest of the energy taking the form of heat, which warms the living substances and escapes. Hence it is that ALL LIVING THINGS PRODUCE HEAT, AND THE MORE WORK THEY DO THE GREATER IS THE HEAT PRODUCED.

We have seen that food is necessary for repair and renewal; we now see that food is also necessary to supply the complex bodies which will liberate energy. The excretions also contain not only the scrap-heap bodies due to repair, but also the degenerated remains of the food taken as fuel.

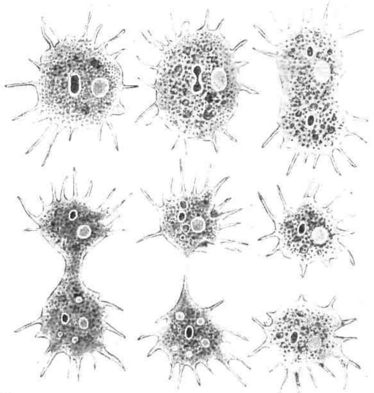


Fig. 8.—*Amœba* in six successive stages of division, showing the elongation and subsequent division of both protoplasm and nucleus, resulting in two *amœbæ*, each with a nucleus. (After Schulze.)

3. RESPONSE TO CHANGE AND SURROUNDINGS.—A child wishing to find out whether an object is living will prod the object with a stick, or make a loud noise, and then see whether the object moves. In physiological language, the child has applied a stimulus, and the object, if living, will respond to this stimulus. This change in a living animal produced by a change in its surroundings is a most important characteristic of life. The more highly developed an animal is the more able is it to detect changes in its surroundings, and the quicker and better can it respond. Now, this response to stimulus has always a certain character—it tends to preserve the life or the comfort of the living thing concerned.

A rabbit prodded with a stick will run away; a dog similarly treated may bite its tormentor; but both with the same object in view. Another feature of this response will be noted, namely, that the response is not limited only to the spot stimulated. This is observable with the lowest animals. Touch one of the tentacles of a sea-anemone, and all the tentacles are drawn in. Even in a single-celled animal a stimulus which irritates one only of its tiny projections of protoplasm may be followed by the cell shrinking and drawing in all its protoplasmic feet. There must be some means, therefore, by which one part of the organism can send messages to the other parts—this mechanism we shall deal with in another chapter.

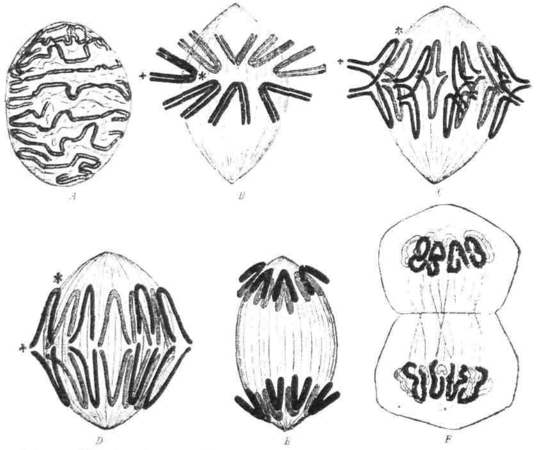


Fig. 6.—Showing the complicated structure of the nucleus and the changes it undergoes on division. (After Flemming.)

What changes in the environment are able to evoke a response from the cell?

(*a*) *Temperature Changes.*—If the temperature of the surroundings is lowered, the activities of the cell become sluggish—with rise of temperature a rise of activity occurs. But there is a limit to this response to warmth, for very soon the high temperature destroys the living substance, and causes death. In fact, no living cell can stand the temperature of boiling water, and most die at 125 degrees Fahrenheit. Heat high enough to injure living substance, if applied to any part of the living substance, acts as a powerful stimulus to that part, and causes a response from the whole organism.

(*b*) *Changes in Concentration of the Surrounding Fluid.*—The changes vary with the cell observed, and need not be described here, only it must

be noted that, just as with temperature, there is a limit. High concentrations will kill—witness the *Dead Sea*, and the preserving action of strong syrup; whilst too low concentrations tend to make the cell become waterlogged, and finally to burst.

(*c*) *Changes in Light.*—With most cells very strong light acts as an irritant, and often causes death; hence the disinfecting action of sunshine.

(*d*) *Electrical Changes.*—To all cells a sudden change in electrical condition (*i.e.*, a shock) acts as a stimulus, and may kill, if sufficiently great.

(*e*) *Chemical Changes.*—Sometimes we find that cells are attracted by some chemical substance, or have their activities heightened. Many cells move away from irritating chemical bodies. All substances which chemically injure living bioplasm act as stimuli.

(*f*) *Mechanical Changes.*—Alterations in vibration or pressure may call forth a response. Local pressure, if intense enough, always acts as a stimulus.

4. DEFENCE.—Living bioplasm is, as we have seen, readily disturbed or killed by changes in the surroundings, and all living things have living enemies. The lower in the scale living things are, the more readily and in greater number do they succumb to such changes and attacks, but in the lowest forms there is always some attempt at defence. Many single-celled animals clothe themselves with a hard shell (see Fig. 7); most living things capable of movement try to escape from injurious surroundings. It is probable that in all animals there is, in addition, a chemical response in the living bioplasm, by which antidotes are produced when the poison is derived from another living thing. This will be discussed more fully in the chapter on immunity.

5. GROWTH AND REPRODUCTION.—Most living things start life small, and grow larger; but all living things reproduce their species. A single cell may divide into two in the manner indicated in Figs. 8 and 9, or its bioplasm may break up into a large number of very small spores, *each of which is capable of growing into an individual cell*. There are many other forms of reproduction, but throughout the whole realm of life the law holds THAT EVERY LIVING INDIVIDUAL IS THE OFFSPRING OF ANOTHER INDIVIDUAL, AND THAT EVERY CELL HAS ARISEN FROM ANOTHER CELL. This is a very important principle, which has now a wide practical application. If a food-stuff (meat, milk, fruit, &c.) is heated to destroy all living germs, and then sealed in an air-tight vessel, no life can develop in it, and, in consequence, the food *keeps*. If any form of life—for instance, bacteria—should be found in such a packet, as would be evidenced by the putrefaction of its contents, we know that either the germs were not all destroyed at first, or that life has come in from without by means of a leak in the vessel wall.

6. MEMORY AND INTELLIGENCE.—A locomotive running into a snowdrift will rebound, and then charge the obstacle again; a second rebound will then take place, to be followed by another charge. This will go on until the steam is exhausted or turned off by the driver. But if a living cell moving about meets with an obstacle it may charge it once or twice in the same manner, yet, sooner or later, it alters its direction of attack, or simply tries to find a way round. This reaction, which has been called the method of TRIAL AND ERROR, implies the existence of MEMORY in the cell (*i.e.*, it can remember its failure), and also of INTELLIGENCE, for it tries a new way of getting over the difficulty.

Animals are marked off from plants by the possession of these faculties in a much greater degree. The higher in the scale of life an animal is the wider is its range of memory and intelligence. It is in mental characters that man is so far apart from the mammals nearest to him (chimpanzee, &c.); in other respects the differences are trivial.

TREE BUILDING.

Results of Systematic Work on the State Demonstration Grounds.

C. Bogue Luffmann, Principal, Burnley School of Horticulture and Small Farming.

In 1902, or four years from the time of writing, six small areas were selected in as many parts of the State, with the object of showing how soil should be prepared and thrown into form; what species of trees

ROW OF TWO-YEAR-OLD APPLE TREES PLANTED ON BOLDLY RIDGED LAND.
Trunks heavily bandaged throughout summer. Difference between crown of planting line and centre furrow, about 16 inches.

should be selected; and how they should be pruned and cared for, in order to yield profitable returns. The nature of the preliminary, as well as the ordinary, routine work has already been set forth in this *Journal*, and it now remains to show how far the trees have progressed, and stand as a safe guide to those engaged in commercial orcharding.

It may be said at once that, taking the trees as a whole, they are fully twice the size of average four-year-old trees. But more important than this, they are very robust and broad based; open enough to secure light and fruit in every part; their general design renders them capable of the largest possible yields of fruit with the least possible strain, either physical or mechanical; they will prove very easy to prune and manage; being vital in every part, they will have the fullest powers of resisting both insects and disease; their shape and general condition is conducive to a long and profitable life.

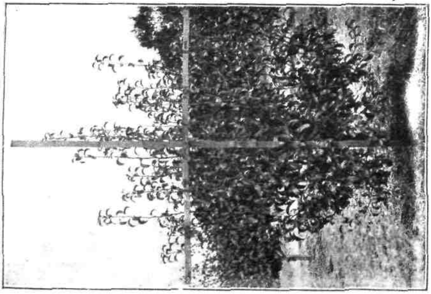
The youngest trees selected for illustration are growing in the State demonstration orchard at Castlemaine. The soil is of the very poorest description, originally no more than 3 or 4 inches of broken shale, and resting on close, dry, and very uncongenial material. But, recognising

PEARS, PLUMS, AND APPLES, THREE YEARS PLANTED.

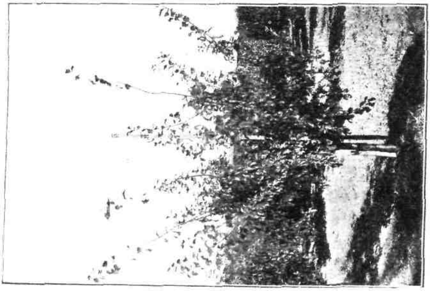
that a good man is of more importance than a good soil, it was decided to show what skill and industry may produce on a poor piece of land. Mr. C. H. Greensides, who owns and works the State orchard at Castlemaine, has shown a rare faculty for the work, though orcharding is not

ROW OF THREE-YEAR-OLD PEARS IN POOR, THIN, AND EXPOSED SOIL.

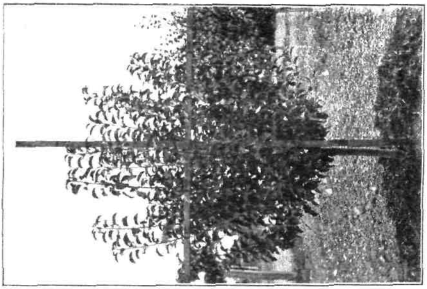
his profession, and I take this opportunity of stating that the orchardists of Victoria, and those of his own district in particular, may thank him for furnishing a safe and lasting example of soil and fruit tree management.



THREE-YEAR-OLD PEAR TREE.
Height: 8 ft. 4 in.; diameter, 5 ft. 6 in.; trunk, 3 inches in diameter.

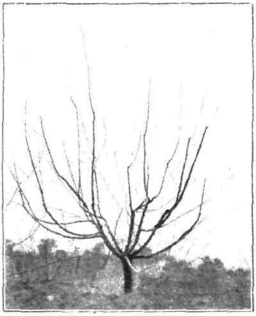


THREE-YEAR-OLD PLUM TREE.
Height, over 10 feet; diameter, over 8 feet; trunk, over 3 inches in diameter.



THREE-YEAR-OLD APPLE TREE.
Height, 8 feet; diameter, 5 ft. 6 in.; trunk, 2½ inches in diameter.

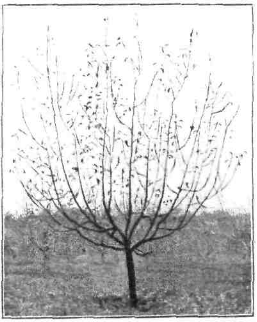
Excellent work has been done in all the State orchard blocks, but Castlemaine is placed first owing to its representing a very large area of the State, and the excellent results achieved under such hard conditions.

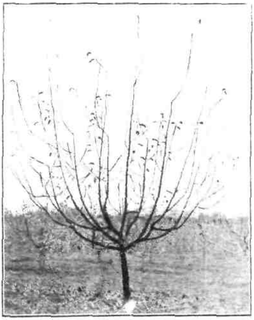


PEACH TREE IN DEMONSTRATION ORCHARD, RUTHERGLEN.
Unpruned and pruned.

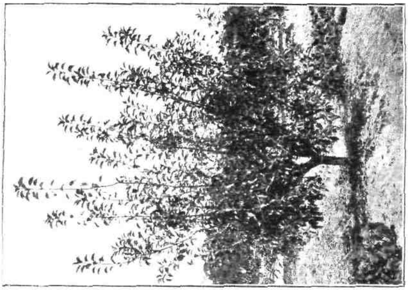
Notable features in connexion with these orchards may be set out as follows:—

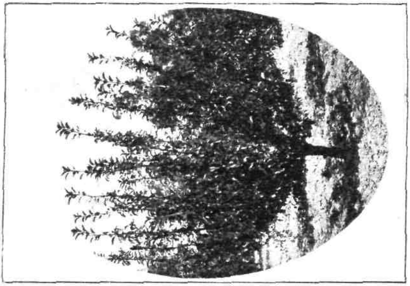
1. All trees were planted above the mean of the land. That is, the soil was boldly ridged by ploughing two, three, or four times on the same line, thus securing a deep mass of well drained and aerated soil at the time of planting. Actual mounds were in some instances secured by hand labour.

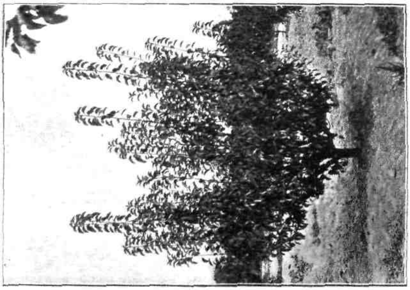




APPLE TREE IN DEMONSTRATION ORCHARD, RUTHERGLEN.
Unpruned and pruned.
Both this and the previous example are capable of bearing in every part, and as long as they live.



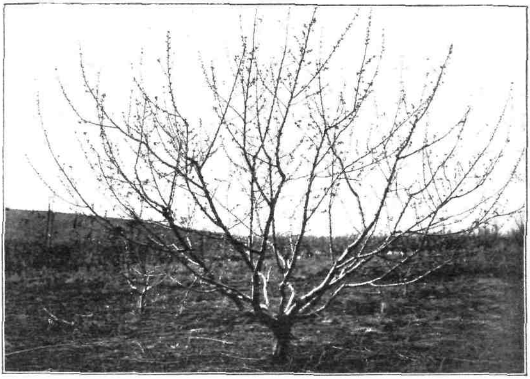




THREE VARIETIES OF SIX YEAR-OLD APPLE TREES GROWN AT BURNLEY GARDENS.

All over 10 feet high and 9 feet wide; perfect leaves and fruit from trunk upwards.

2. All trees were selected with trunks of a length proportionate to their strength, and the native bias and requirements of each sort. Thus,



MATURE PEACH TREE, DROUIN DEMONSTRATION ORCHARD.

Fruiting in all parts, but still too thick in the top. About two-thirds of the light wood calls for removal.

ROW OF PERFECTLY FORMED YOUNG PEACH TREES, DROUIN.

Fruiting wood equal in all parts; unpruned.

peaches and apricots always have short trunks; strong pears, plums, and apples have trunks from 18 to 30 inches long, according to position;

whilst weak pears, plums, and apples have short trunks, not exceeding 1 foot or 15 inches.

3. A few heavy, as against fibrous, roots are chosen for all trees planted in ordinary dry and open country.

4. Trees which have not been subjected to summer pinching when in the nursery are always sought, straight rods being much more capable of yielding good trees than such as are during summer cut to a uniform height, regardless of their kind or vigour, or the class of country in which they are eventually to grow.

5. The trees were cut harder than is usual at the time of planting, both roots and heads being reduced to three or four stout stubs. In many cases the heads were cut off, owing to the existing head being too weak or otherwise faulty. In all cases these deheaded trees now furnish the best specimens. It is not always safe to cut the head from

MATURE APPLE TREE AT BURNLEY GARDENS.
Kept light in the extremities and thereby enabled to fruit evenly and regularly.

a faulty nursery tree, much depending on the vigour of the roots and stem, and its power of forcing and sending out buds on a line where the head is desired. As in all else, experience is wanted in this matter.

6. All trees were planted very shallow, the top roots being but an inch at most beneath the soil. Water was in all cases used to wash in and settle the soil about the roots.

7. Sackcloth bandages encased the stems from the time of planting. These were taken off occasionally and re-adjusted, so as to prevent any injury by their cutting into the bark or acting as ligatures. Trees with thick bandages are usually about double the size of such as go unbandaged. This applies more particularly to open and dry country.

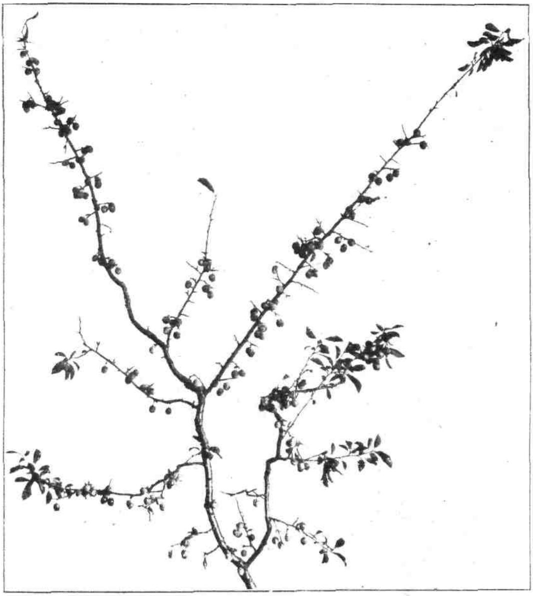
8. A manure or litter mulch was spread about each tree in spring. No water was available in summer.

9. Ploughing was almost entirely up to the trees, hand labour being used to grade out any excess of soil above the roots.

10. Various summer and winter crops have been grown between the trees from the time of their planting until now.

11. The cost of working has not been greater than that of the average orchard in Victoria.

Thus far the trees under notice have clearly demonstrated that hard cutting during the nursery stages is a practical necessity under average Victorian conditions, but a great difference exists between the requirements



BRANCH OF PLUM IN FRUIT.
Over 9 feet in length.

of such trees as apples and pears, or peaches and apricots. Apples usually call for three or four close prunings before being allowed to run into slender branches, whilst pears, if at all sturdy and well supplied with foundation branches, may require but a single cutting back before allowing the head to form.

Some of the best examples illustrated in this article received but one or two winter prunings, the work of the remaining two years consisting of

BRANCH OF APRICOT IN FRUIT.
Over 10 feet in length.

disbudding and stopping excessively strong wood in spring and early summer. Again, the peach requires more persistent pruning than does the

apricot in early life, and for these reasons: Peach branches are liable to run too light, in which case they cannot last long; whereas the apricot makes excessively strong wood, if pruned at all hard, or it may suffer from gumming, and thereby fail to make a sound and shapely tree. Under the most ordinary conditions, peaches require about three close prunings, and each followed by very careful work in spring; whilst apricots, if pruned hard at planting, and again the year after, will usually be found to make branches of sufficient number and substance.

Of course, it must never be forgotten that trees are individuals, and that each, being stationary, occupies a more or less unique position. Therefore, a shape, size, and degree of vigour favorable to one may prove quite inadequate to another. What these Demonstration orchards clearly prove is that the more intelligently the tree is designed, the sooner will it be in a position to bear fruit without check or injury to its main wood.

Another point may be again referred to, since it is, perhaps, the most important lesson of all in connexion with orchard work in Victoria—the surface form, and condition of the soil. No method of pruning or surface cultivating could possibly have resulted in such trees as are here illustrated, had the soil not been boldly ridged, increased in quantity and quality, and mulched throughout the hot season. Those interested in this subject should read an article on "Soil Surfaces" which appeared in the *Journal* for June, 1905. In brief, the soil, as it exists in these Demonstration orchards, is moist over a longer period of summer, and warm and dry over a longer period of winter, than are the surrounding areas which have been cultivated over their natural surfaces.

The illustrations of mature trees are intended to show the result of thinning as against the common practice of cutting over the heads of trees regardless of their age, size, and actual requirements. The peach tree is a type which may well be striven for in all the best peach country. In very hot and dry positions it may be a little more upright and robust in its main wood, since vertical growth makes for vigour and long life; but in no case should the top of the head wear a bunched and barbered look, as this can only be obtained at the expense of barrenness in the lower limbs, as well as inducing premature decline of the whole tree.

The branch which is illustrated on page 465 was taken from a full-sized plum, having a spread of 16 to 18 feet, and it shows fruit within 4 inches of the trunk, and continuing over all its ripened wood. It may be noted that, though the crop is a heavy one, ample space and sound leaves exist for the development of a crop in the following year.

Plums are, as a species of fruit, the least capable of bearing in the dark interiors of robust and self-shading trees. Hence the necessity for keeping their extremities so open and light in substance as to insure ample means for true leaf development in the lower parts. The foregoing illustration was taken from a tree which had practically ceased to bear through the crowded nature of its top growth. Two years thinning-out, and a little summer work in the form of checking excessive shoots, led to the results shown.

The full-length branch of apricot, cut direct from and fruiting within 9 inches of the trunk, is a further illustration of the value of spacing the branches and keeping their extremities open and light. Moreover, it is usually desirable to secure a great proportion of spreading, or more or less horizontal, wood in apricot trees. The tree from which this branch was

taken has been equally clothed with fruit for several years in succession. The pruning has been of the lightest description—taking away any excess of shoots in the top, and cutting out any damaged, crossing, or exhausted wood within the body of the tree.

Finally, these illustrations and remarks are to be regarded as appropriate to the regions under notice. In a general way, three more or less distinct shapes and degrees of vigour are necessary to fruiting trees in Victoria. This article has dealt with variants of one type only. Another article, with a complete set of diagrams, will show what is desirable and obtainable in different parts of Victoria.

THE ORCHARD.

James Lang, Harcourt.

The weather during the past two months has been unusually mild, with an almost entire absence of frosts, in contrast to last winter, which was abnormally cold and late. Should this mild condition of the weather continue we may fully expect an early spring; orchardists will, therefore, have to be up and doing in order to get the work well advanced before its advent. Planting and pruning operations should now be brought to a conclusion by the end of the month. Any old and worn-out fruit trees should be headed well back to the fork of the tree, and, if of a good variety, allowed to shoot again. As more shoots will start into growth than what are required, these should be thinned out, leaving only those necessary to reform the tree. The ends of the stock where cut off should be smoothed over with a sharp knife, and rubbed with some paint to keep out the wet and prevent decay. If the variety is a poor one, it had better be grafted with a more suitable and up-to-date variety. By this means the life of the tree is renewed, provided the stock is healthy. Last winter the writer headed back in this way a number of Stone Pippin trees, which were old and unprofitable; every one of these has now made a healthy growth of strong wood, and, in two or three years, will again be bearing good crops of first-quality fruit.

Peach trees will now require attention to keep the aphis under. There is no remedy better than the old tobacco and soap solution; put 1 lb. of tobacco leaf in a tub, and pour over it 4 gallons of boiling water, cover it over, and allow it to infuse for an hour or two. Then dissolve 2 lbs. soap in 2 gallons of water, add this to the tobacco water and make up the whole to 20 gallons of spray. Kerosene emulsion is also good for the aphis. Boil ½ lb. soap in 1 gallon of water, and, when dissolved, add 2 gallons kerosene and churn briskly through a force pump for about ten minutes until thoroughly mixed; this should be made up to about 30 to 40 gallons.

As red spider has been very prevalent during the past summer, all kinds of fruit trees should be sprayed with the kerosene emulsion to destroy it; be careful to spray the under side of the branches and small spurs, as it is in those places where the red spider harbours during the winter. The codlin moth should also be looked after by scraping the trees of all loose bark, and stopping up any holes that may harbour the grub; broken ends of limbs should be cut clean off. One grub destroyed now prevents quite a large number appearing in the springtime.

POTATO EXPERIMENTAL FIELDS, 1905-6.

George Seymour, Potato Expert.

The object of the following experiments was to test the effect of artificial manure, farm-yard manure, and lime, on the cultivation of potatoes; also to test the cropping qualities of various kinds of potatoes in different soils. They were carried out on the potato section of the "5-acre" forage fields, 1905. The area planted in each instance was 1 acre, divided into six sections, one of which received no manure, three various dressings of artificial manure, one lime, and one farm-yard manure, where practicable. From 6 to 22 varieties were used in the plots, each drill being 6 chains long, with an even number of sets in each section, so that practically there were six sets of experiments with each variety of potato. It is to be regretted that, owing to the unevenness of the soil on some of the plots, these manure tests are not of as much value as they would otherwise be, and it must be also stated that some of the land could not in any sense be regarded as a potato soil. Yet on some of these remarkably good potatoes were grown, notably at Mr. Anderson's, Digger's Rest, where the difference in yield, owing to the use of manure, was very marked, and the difference in the type and quality was even more marked. On the unmanured or check section in some of the varieties it was almost impossible to find a single tuber large enough for table use; they were not only small and irregular in shape, but lacking type and quality.

One thing may be mentioned in connexion with the use of potash, viz., the tendency to produce scab; this was also present to a small degree in the section dressed with farm-yard manure. The quantity of potatoes affected by scab seems to be on the increase, and it would be advisable for growers to try the effect of pickling or dressing their seed before planting with either of the following preparations:—Half-pint formalin to 15 gallons water—soak the seed for two hours; or, 1 oz. corrosive sublimate to 7 gallons water—immerse for 1½ hours.

It is to be regretted that in some cases the results were very disappointing, owing chiefly to the continued wet weather at the end of last winter and early spring, which seriously interfered with the preparation of the land on several of the plots; in one case a plot had to be abandoned on that account. The work of planting was also delayed from the same cause, some of the plots being a month later than they should have been.

The results shown at the foot of the accompanying table are for a number of varieties planted by Mr. Jellie himself, on an unmanured plot. They were nearly all heavy-yielding varieties, and the land being in good heart, the average was over 10 tons per acre. The only light-yielding sort was the Brown's River, grown from a parcel of seed bought on the market. It yielded a little over 5 tons per acre, but gave a very poor return of tubers fit for market. To the growers who visited the field to watch the operation of digging and selecting seed, it, however, proved a valuable object lesson, and illustrated in a practical manner the failure of many growers who buy seed on the market, as more than two-thirds of the produce was discarded. Twenty-five per cent. of the plants were of the wild white bloom strain, and fifty per cent. were yellow-fleshed or inferior in quality. These averages were duly noted at the time of digging, and

will form the basis for future experiments, and will prove the value of the selection of seed at the time of lifting the crop, as the seed saved from this plot will be planted again next season.

Although the general results may appear disappointing, still some valuable information has been obtained, and a basis laid for future operations. All the varieties were closely culled, and the results noted, so that the improvement of the standard of the different varieties and strains can be ascertained.

IMPORTED VARIETIES.

The varieties imported by the Department of Agriculture were divided into two lots. One, consisting of 20 varieties, was planted at Mrs. Bland's farm, Yarram; and the other (25 varieties) at Mr. E. S. Hill's farm, Iona, Bunyip. The former were planted on 2nd October, the land being lea ground in fairly good condition. The sets came up almost without a miss, and at the end of November the whole crop looked very promising, but a heavy fall of rain occurred on the 2nd December, which completely flooded a large portion of the ground, and rendered it impossible to work the land, consequently the crop was only a poor one. When visited on 6th December the plot showed the effects of the manures in a marked degree, which totally disappeared before the plants reached maturity, thus showing the injury caused by the rain.

The plot at Bunyip was on a rich peaty soil. The land was well prepared, and the crop planted on 7th October. Like the plot at Yarram, the crop came up well, and gave promise of a good return, but was unfortunately cut to the ground on 28th November, on which date Mr. Hill reported 8 degrees of frost. This plot was visited on 16th December, when it had the appearance of a crop just coming through the ground. The check seriously interfered with results of the plot, which otherwise gave promise of being one of the best plots of the season, as the land was in good heart, well prepared, and the attention to the growing crop all that could be desired.

VALUE OF THE IMPORTED VARIETIES.

There can be no doubt that a number of the imported potatoes will prove a valuable addition to those already grown in the State. In point of quality Sir John Llewellyn will maintain its British reputation as an early maturing potato of first-class quality, showing the whiteness of the flesh of Carman No. 1, with a finer texture and flavour equal to Beauty of Hebron; but, like most of the fine quality early sorts, it is a light cropper, and, if good yields are to be obtained, it must receive generous treatment. Duke of York is another early variety, and a fair cropper; it produces an even-sized lot of tubers, with very few small ones; has a yellow skin and flesh, cooks well, with a peculiar sweet flavour, but on account of its colour is not likely to take on the local market. Duke of Rothesay is a very hardy early sort, and a fairly good cropper; and so is the Early Puritan, a potato well known for some years on the local market.

The heaviest cropper of all the early sorts is the British Queen, which in British experiments has returned as high as 17 tons 12 cwt. per acre; but so far it has not maintained its reputation, the highest yield being 5½ tons in section D at Mr. Duff's plot, Carrum. On account of its blight-resisting quality it has been inquired for in New Zealand for seed. Amongst the early varieties may be included the Duchess of Buccleuch, which gave a consistent return in all the sections of the Iona plot, where

the average weight was over 2 tons 12 cwt., section A showing 3 tons. Of the main crop varieties, The Factor, Warrior, Scottish Triumph, and Up-to-date came in the order mentioned. Of all these, perhaps the Up-to-date must be considered the most profitable potato, having come out top in the most recent experiments in Great Britain as a disease-resistant variety. The verdict of the great British authority, Mr. W. P. Wright, who says it is "the greatest potato that has come out for a hundred years," will, no doubt, be indorsed in New Zealand; but probably The Factor, Warrior, or Scottish Triumph would take the local market better, as they are whiter in the flesh, and have a better appearance when cooked.

AVERAGE YIELDS OF BEST EARLY VARIETIES.

Variety.	Tons.	Cwt.	Qrs.	Lbs.	Yield of Best Section.	Tons.	Cwt.	Qrs.
Duchess of Buccleuch	2	12	2	18	A	3	0	0
Sir John Llewellyn	2	6	2	18	B	2	12	0
Duke of Rothesay	2	6	2	18	F	3	2	0
King Edward VII.	2	8	0	0	F	2	16	0
Early Puritan	2	3	1	9	E	2	12	0

AVERAGE YIELDS, BEST MAIN CROP.

Variety.	Tons.	Cwt.	Qrs.	Lbs.	Yield of Best Section.	Tons.	Cwt.	Qrs.
The Factor	2	12	0	0	A	3	4	0
Warrior	2	10	2	18	D	3	2	0
Scottish Triumph	2	4	1	9	B	2	16	0
Up-to-date	2	2	2	18	F	2	10	0

OLD VARIETIES.

Twelve or fourteen old varieties were planted in the different plots, most of which gave very satisfactory results. Among these one known as the Copper Skin proved itself worthy of more attention than it has received at the hands of growers; it is a consistent cropper, throws very few small potatoes, and the quality is quite equal to the old Pinkeye. In Mr. Jellie's plot at Woodford it gave a yield equal to 8½ tons per acre. In the white skins, Sutton's Abundance and Clark's Main Crop gave very satisfactory results, the former producing very large tubers of good shape and quality, the latter throwing a large number of medium-sized tubers, with but few very large ones. Daniel's Sensation (also white skinned) gave good results; it is a very vigorous grower, stands frost well, and is of good quality. One of the best early ones was that planted under the name of Fox's Seedling. I cannot say whether the name is correct, as I have been unable to trace the history of it. In a good soil it will give a heavy yield; at Woodford it gave a return equal to 14 tons 8 cwt. It is a good cooker, and is quite equal to Beauty of Hebron. Bismark is another good variety; it did well in the Warrnambool district.

RED SKINS.

Much has been said about the deterioration of the "reds." Many contend that their day is past, but there is no doubt that the old Brown's River and Tasmanian Red are still the most popular main crop varieties on the market. These two varieties were planted in four different plots. Those marked Nos. 1 and 2 are the same, the numbers being used to

distinguish different strains of seed; the returns were very satisfactory, the average being over 4 tons per acre, and better results may be expected next season, as the seed has been heavily culled. In order to obtain good yields of either of the above varieties the land must be in good heart.

THE EFFECT OF PASTURE IN THE ROTATION.

There can be no doubt that the very satisfactory returns obtained in the Woodford plots, which averaged over 10 tons per acre, were due in a large measure to the fact that the land had recently been under grass, the rotation being five years in pasture, then a crop of potatoes, followed by hay and the present crop of potatoes. If growers followed the practice of sowing down to grass and clover in the old potato-growing districts, the yield of the State would be maintained on a little more than half the present area. In addition, the quality of the produce would be greatly enhanced, so that about half the land under potatoes, the other half being in pasture, would yield as many potatoes, and the grower would obtain a far more profitable return than at present.

NAMES OF VARIETIES.

Much confusion has arisen in the past through potatoes being called by wrong names. In some cases the same variety is known by four different names. For instance, many white-skinned potatoes are called Snowflake. When this potato was first introduced it was considered an early variety; but now The Acme, White Elephant, and Prolific, all late maturing sorts, are called Snowflake in different districts.

Much damage is also being done to the seed trade by inferior or late-maturing varieties being supplied for early ones. For example, Acme and Up-to-date have been sold for Carman No. 1, and growers in New Zealand and other places are asking to be provided with a Government certificate as to variety; but the grower is the proper person to supply this. Certainly, there are varieties that cannot be mistaken, but when it comes to the white-skinned ones it is impossible at all times to identify a potato without growing it, because there are so many that resemble each other, or vary so much in appearance when grown in a different soil, that they lose many of the characteristics of the variety to which they belong.

Results of Manure Experiments.

Mr. F. E. Lee, Agricultural Superintendent, has kindly furnished the following report on the results of the manure experiments conducted by him:—Regarded purely from a manurial point of view, the recent experiments with potatoes have in the majority of fields been inconclusive. It will be remembered that the spring of last year was particularly cold and wet, and frosts prevailed till a far later period than ordinarily. This fact, in conjunction with lack of care during the growing period, and a spell of dry weather from October to March, were the main causes of the comparatively poor returns in many districts. A survey of the localities in which many of the fields were situated is sufficient to indicate that the soils could in no wise be considered as typical potato land.

It is pleasing to find that in some instances the manure dressings have not only produced substantial increases in yield over the unmanured portion, but the increases are proportionate, thus showing that with intelligent fertilization profitable yields of potatoes can be raised in localities hitherto considered unsuitable for this crop.

MANURE DRESSINGS.

The potato section occupied 1 acre of the 5-acre experimental forage fields, and was further subdivided into six equal portions, lettered A to F. To section A a dressing of 2 cwt. superphosphate was given; to section B the same amount of superphosphate, together with 1 cwt. nitrate of soda; section C received no manure, and serves as a contrast for all other sections; section D received the same treatment as B, together with ⅔ cwt. of sulphate of potash; section E received a dressing of lime at the rate of 5 cwt. per acre; and section F was dressed with stable manure, as nearly as possible, at the rate of 10 tons per acre. Although only requiring a small amount of stable manure, considerable difficulty was experienced in procuring it, and only in a limited number of cases was it applied and ploughed in at the proper moment. I am, therefore, forced to the conclusion that no great reliance can be placed on the result of section F in the first year's trials.

The dates of sowing in various localities and the classification of varieties are more fully dealt with by my colleague.

HARVEST RETURNS OF PLOTS.

Experimenter.	A.	B.	C.	D.	E.	F.
	tons.	tons.	tons.	tons.	tons.	tons.
Mr. Anderson, Digger's Rest ...	1·7	2·0	0·8	2·3	1·0	1·3
Mr. Wilson, Whittlesea	0·6	0·9	1·2	2·0	1·2	0·4
Mrs. Bland, Yarram	1·7	1·1	0·6	0·6	0·5	0·4
Mr. Hill, Bunyip South	2·1	2·0	1·9	1·8	2·1	1·3
Mr. Cameron, Condah	5·4	6·0	4·2	5·4	4·1	3·9
Mr. Scanlon, Cobden	5·1	5·0	2·7	5·1	2·5	2·7
Mr. Duff, Carrum	4·5	4·8	4·4	4·7	4·9	5·0
Mr. Syme, Mordialloc	2·4	2·3	1·2	0·8	1·2	1·5
Mr. Collins, Illowa	4·0	4·2	4·0	3·7	3·8	3·5
Average yield per acre ...	3·0	3·1	2·3	2·9	2·1	2·2

These returns at first sight do not appear to have very clearly demonstrated the value of fertilization, and yet, taking the high prices ruling for potatoes during the past season, there is a good margin of profit shown over the cost of the manures. For example, the unmanured section C produced an average yield of 2.3 tons per acre; section A, dressed with 9s. worth of superphosphate, produced 3.0 tons, or an increase of 14 cwt. Estimating potatoes of good quality to have been worth £7 a ton, there is a margin of profit of £4 9s. after paying for the manure. Section B, costing 22s. 6d. per acre to manure, shows a net profit of £4 8s. 9d.; section D, costing 31s. 10d. per acre to manure, shows a profit of nearly £2 9s. 5d. per acre; section E, dressed with lime, as might have reasonably been expected, shows little or no benefit the first year. It is probable that crops subsequently planted on the lime section will show an improvement, both in quality and quantity. As previously pointed out, section F, dressed with stable manure in some cases, has had little chance of showing its capabilities in the first year's trials.

HARVEST RETURNS FROM POTATO SE

	Mr. P. Duff, Carrum.						Mr. Collins, Illowa.						Mr. Scanlon, Elingamite.						Mr. Cameron, Condah.						Mrs. B Yarr			
	A	B	C	D	E	F	A	B	C	D	E	F	A	B	C	D	E	F	A	B	C	D	E	F	A	B	C	
*	7.4	7.2	6.5	6.3	6.4	6.3	7.0	8.0	7.2	5.0	5.4	5.4	7.6	6.5	2.5	5.3	2.1	3.5	9.0	10.0	6.7	9.6	5.8	7.6	2.0	1.5	.6	
y	6.0	6.0	5.8	5.5	5.8	6.2	3.1	3.2	3.2	2.6	2.5	2.4	5.2	3.8	3.0	4.4	1.9	3.5	7.2	7.3	3.7	6.0	4.0	3.6	..	..	..	
.	5.8	5.5	5.0	6.3	5.4	6.9	4.1	3.6	4.5	4.6	3.7	3.4	4.1	3.5	1.9	5.5	2.9	2.9	4.3	3.9	4.2	4.3	4.3	2.6	..	..	..	
e	5.8	5.0	5.0	6.3	6.0	6.3	6.2	6.8	4.6	5.3	6.2	6.3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
p .	4.7	4.2	3.9	3.8	4.7	3.0	3.0	3.7	3.5	4.0	3.4	3.1	7.2	5.6	3.4	4.9	2.7	2.4	4.3	5.8	3.6	4.2	3.3	3.6	..	..	..	
n .	7.6	6.9	6.2	7.3	8.6	6.0	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
- .	5.1	5.3	5.6	4.9	5.3	5.7	5.3	4.6	5.7	4.5	4.0	5.7	3.8	4.9	2.3	5.9	2.3	2.0	..	..	..	..	..	..	..	..	..	
l	5.7	6.3	5.0	5.1	5.1	5.4	3.7	3.9	3.7	3.4	3.7	2.9	..	..	..	..	..	..	4.7	4.3	3.4	4.3	4.2	3.6	..	..	..	
.	1.8	1.6	3.1	2.8	3.3	1.6	2.1	2.2	2.5	1.8	2.1	1.5	3.3	2.8	2.1	3.8	1.5	1.5	..	..	..	..	..	..	..	..	..	
.	6.1	6.0	6.4	6.8	8.3	7.3	3.6	4.5	4.6	4.6	4.5	3.2	4.7	4.5	4.0	6.5	4.1	3.4	..	..	..	..	..	..	..	..	..	
f	4.8	6.1	6.0	6.1	6.6	7.7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
	3.3	4.4	3.8	4.9	4.0	4.9	3.7	3.7	3.1	3.1	3.9	2.8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
	3.3	2.9	4.3	3.2	3.5	4.2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
.	1.7	2.5	2.3	2.8	2.8	3.1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
.	4.1	3.7	3.4	4.0	4.1	4.3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.5	1.5	.8	
f	4.1	3.6	3.1	3.5	3.7	4.5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.1	.8	.3	
.	1.5	2.3	1.8	2.6	2.4	2.0	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.1	.8	.5	
-	4.3	4.6	4.8	4.9	4.7	6.0	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.8	1.0	.6	1
	4.3	4.9	4.0	5.5	4.8	5.1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.3	1.7	1.3	1
.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.5	.8	.4	
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.8	1.4	.6	
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.5	.6	.6	
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.7	.6	.3	
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.2	1.3	.5	
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.5	.3	.3	
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.3	.8	.6	
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.9	1.0	.7	
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.4	1.5	.8	
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.2	.4	.3	
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.7	.8	.5	
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3.0	2.8	1.1	1.
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.9	1.8	.9	1.
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.5	1.2	1.1	.
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3.3	4.8	3.6	4.2	3.1	2.5	..	..	..	.
	..	..	..	..	..	..	3.0	3.0	2.4	2.6	3.1	2.3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.
	3.2	3.2	3.4	3.4	3.6	3.8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.
	4.5	4.6	4.4	4.7	4.9	5.0	4.0	4.2	4.0	3.7	3.8	3.5	5.1	5.0	2.7	5.1	2.5	2.7	5.4	6.0	4.2	5.4	4.1	3.9	1.7	1.1	.6	.

* Varieties imported by the De

In Mr. Jellie's field, which was unmanured, the average yield per acre from the following varieties was obt
.5 tons; Fox's Seedling, 14.4 tons; and Brown's River, 5.1 tons.

FIVE-ACRE FORAGE FIELDS—SEASON 1905

Mr. E. S. Hill, Iona.						Mr. Anderson, Digger's Rest.						Mr. Wilson, Whittlesea.						Mr. D. Syme, Mordialloc.						Average of all Sectio[ns]			
A	B	C	D	E	F	A	B	C	D	E	F	A	B	C	D	E	F	A	B	C	D	E	F	A	B	C	D
2.1	2.0	2.3	1.8	2.1	2.5	2.8	2.7	1.1	3.4	1.6	1.8	..	..	..	..	..	..	..	..	..	..	..	..	5.4	5.4	3.8	4.5
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3.5	1.5	1.1	1.2	2.0	2.3	5.0	4.3	3.3	3.9
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4.5	4.1	3.9	5.1
..	..	..	..	..	..	1.8	2.1	.8	2.8	1.2	1.3	.3	1.1	1.4	2.8	1.2	.5	..	..	..	..	..	..	3.5	3.7	3.2	4.3
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4.8	4.8	3.6	4.2
..	..	..	..	..	..	1.7	2.2	1.1	2.5	1.5	1.6	.8	1.4	1.2	2.2	1.2	.4	4.9	2.8	2.1	1.3	2.2	2.3	3.7	3.3	2.6	3.3
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4.7	4.9	4.5	5.1
..	..	..	..	..	..	..	..	..	..	..	..	1.4	1.9	2.1	3.1	2.2	.8	..	..	..	..	..	..	3.8	4.1	3.5	3.9
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.4	2.2	2.5	2.8
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4.8	5.0	5.0	5.9
..	..	..	..	..	..	1.2	1.5	.8	1.8	1.1	1.2	.6	.9	1.3	1.4	1.0	.4	2.8	4.0	2.3	.9	.9	1.0	2.3	3.1	2.6	2.5
..	..	..	..	..	..	..	..	..	..	..	..	.6	.6	1.2	1.8	1.2	.2	1.5	1.7	.8	.3	.3	.6	2.2	2.6	2.2	2.5
..	..	..	..	..	..	1.5	2.0	.6	1.6	.4	1.0	.1	.4	.4	1.0	.6	.2	..	..	..	..	..	..	.8	1.2	.5	1.3
..	..	..	..	..	..	..	..	..	..	..	..	.6	.7	1.5	1.8	1.6	.6	2.3	2.3	1.5	.7	.8	1.0	2.0	1.9	2.4	1.9
..	..	..	..	..	..	..	..	..	..	..	..	.6	.9	1.2	2.1	1.3	.6	3.4	2.6	.7	.7	1.1	1.6	1.9	2.0	1.4	1.8
1.3	1.0	.9	.8	1.6	1.7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.3	2.0	1.7	1.8
2.5	2.2	2.6	2.0	2.4	2.7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.5	2.2	2.0	1.9
2.1	1.7	2.6	1.7	1.8	1.1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.5	1.6	1.6	1.6
2.4	2.7	2.2	1.9	2.0	2.7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.8	2.7	2.5	2.6
1.7	2.2	1.8	1.7	1.9	2.5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.8	2.9	2.3	2.9
2.2	2.6	2.0	2.4	2.5	2.2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.8	1.7	1.2	1.4
2.2	2.8	2.4	2.0	1.9	2.0	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.0	2.1	1.5	1.2
2.1	2.3	2.4	2.8	2.4	3.0	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.8	1.4	1.5	1.7
2.5	2.3	1.6	1.7	2.6	2.3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.1	1.4	.9	1.0
3.0	2.4	2.1	2.0	2.4	2.1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.6	1.8	1.3	1.3
1.3	1.6	1.0	.7	2.5	1.2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.4	.9	.6	.5
2.0	2.1	1.6	2.4	2.5	2.7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.6	1.4	1.1	1.3
3.2	2.3	2.5	2.2	2.8	2.8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.5	1.6	1.6	1.4
2.0	2.7	2.0	3.1	2.5	2.8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.2	2.1	1.4	2.0
1.0	2.3	2.5	2.0	2.4	2.2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.3	2.5	2.0	1.6
2.7	2.3	2.1	2.2	2.2	3.0	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.2	1.5	1.3	1.3
2.4	1.9	2.2	2.2	2.5	3.1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.7	2.3	1.6	1.9
2.8	2.2	1.8	2.0	2.1	2.2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.3	2.0	1.3	1.6
2.4	2.4	2.2	2.3	2.3	2.8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.9	1.8	1.6	1.6
..	..	..	..	..	..	1.5	1.5	.8	2.2	.6	.9	..	..	..	..	..	..	2.9	.7	.5	.6	1.1	1.5	2.2	1.1	.6	1.4
2.6	1.9	1.6	1.3	1.7	2.6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.6	1.9	1.6	1.3
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3.3	4.8	3.6	4.2
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	[illegible]	3.0	2.4	2.6
1.6	.8	1.5	.9	1.5	2.0	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.6	.8	1.5	.9
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3.2	3.2	3.4	3.4
2.1	2.0	1.9	1.8	2.1	1.3	1.7	2.0	.8	2.3	1.0	1.3	.6	.9	1.2	2.0	1.2	.4	2.4	2.3	1.2	.8	1.2	1.5	..	..	..	..

of Agriculture for experimental purposes.

Satisfaction, 9.3 tons; *Clark's Main Crop*, 9.3 tons; *Bismark*, 8.5 *tons*; *Up-to-Date*, 16.1 tons; Copp[…]

INDIVIDUAL CROPS.

Some of the fields under review have shown a much more regular response to the manure dressings than the average of the whole. This may be ascribed as much to the care and attention shown as to other causes. Badly drained places in some of the plots are responsible for the irregularities of yield. In the case of Mr. Syme's field at Mordialloc—section D was on a sand ridge, which reduced the yield of that plot considerably. Mr. Anderson's field at Digger's Rest has shown the most regular response to the manurial dressings. Being on sloping land, this field has shown a profitable increase on sections E and F, and the value of the experimental work on this farm will more than compensate the owner for the labour and trouble involved. It is somewhat regrettable that many persons who undertake experimental work do not maintain the enthusiasm with which they commence. I am frequently asked to excise the unmanured section as being of no service. In my opinion, the failures, or, what is perhaps the more fitting term, non-successes are more educative than those experiments which realize to the full the hopes of the experimenter.

CONCLUSION.

The experienced reader will see in this brief review of the potato experiments one fact that will not occur to a person not directly interested, viz., that it is too much to expect such a wide range of early, medium, and late varieties of potatoes to respond in anything like the same manner to artificial manures.

It may safely be assumed that some of the varieties tried have been on unsuitable soil, and with different periods of ripening the average results from a manurial point of view are hardly comparable. Nevertheless, viewing the whole question from a stand-point that does not regard idiosyncrasies of varieties, it is patent that artificial manures intelligently used can be made to render the same assistance to the potato grower as to the grower of other crops. It may be mentioned that the experiments are being continued for three years, the rotative principle being adhered to, so that at the expiration of that term the collected information should prove of the highest value to the potato grower in every district in the State.

THE PROCLAIMED PLANTS OF VICTORIA.

(Second Series.)

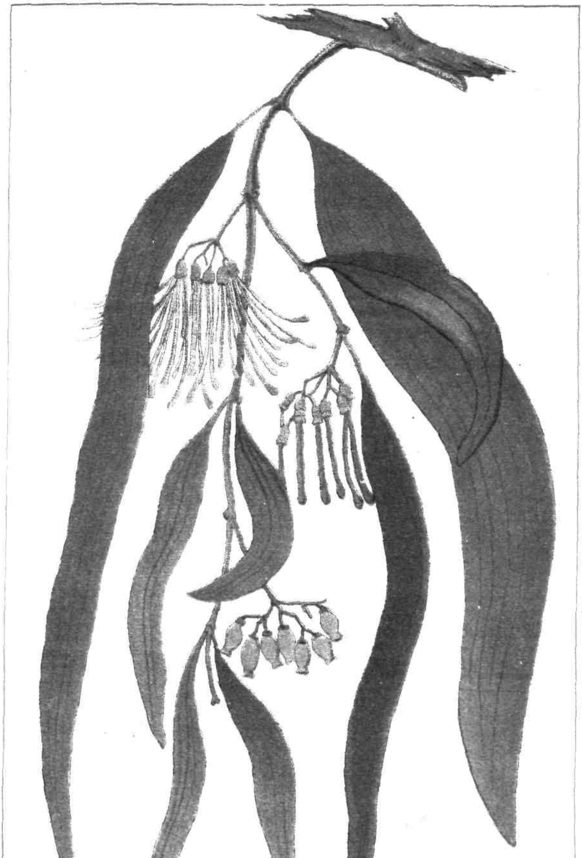
Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

Since the issue of the Thistle pamphlet in 1893, 23 names have been added to the list of plants which are required to be destroyed under the Thistle Act. The present publication consists of a series of descriptions and illustrations of these plants which was originally prepared by Mr. Tovey, and which has been revised and issued in its present form.

The descriptions are made as simple as possible, and the coloured plates should aid in rendering identification a simple matter. Mr. G. H. Adcock, F.L.S., Principal of the Viticultural College, Rutherglen, and Mr. J. W. Audas, of this branch, rendered valuable service in obtaining specimens suitable for illustration.

PLATE 2.

PLATE 3.



D. Wauer, Del. J. R. Tovey, Direxit.

HANGING MISTLETOE.

(*Loranthus pendulus, Sieber.*)

Only short, safe, straightforward directions for eradication are given, since the fancy methods of weed eradication frequently advocated are less certain, are frequently dangerous, and are often as costly as the simple and thorough, but more laborious methods. Poisonous sprays such as copper sulphate may sometimes be used to keep down weeds (charlock &c.) in the seedling condition, especially if applied during dry weather, but their use is never advisable if it can be avoided, and when once a perennial is firmly rooted its destruction requires doses of poison sufficient to injuriously affect the soil and surrounding vegetation for some time. No compounds containing arsenic should be used for the poisoning of weeds on pastures or cultivated ground.

There is no doubt that many of the proclaimed weeds here described are spreading rapidly, with increasing injury to agriculture, and that this fact is due to the imperfect administration of the Thistle Act. In so far as the latter is due to ignorance, the issue and wide circulation of the accompanying descriptions and plates should remove one source of laxity, but the wide divergence in the attention paid to the Act in neighbouring shires will always militate against the permanent eradication or suppression of any particular weed. Permanent good can only be attained by simultaneous and centrally organized efforts, extending over wide areas surrounded by natural barriers to migration.

The Mistletoe.

Loranthus celastroides, Sieber. (Loranthaceæ.)

A parasitic glabrous shrub, on branches of trees. Leaves opposite, from a rounded egg-shape to a narrow lance-shape, and, when narrow, often sickle-shaped; thick in structure. Flowers in loose cymes, usually terminal; petals elongated, five or six, free, often yellowish or somewhat reddish, soon spreading or reflexed; loosely hung anthers. Fruit almost pear-shaped, yellowish green. The Mistletoe is a native of Australia. This parasite spreads over the trees, and eventually destroys them. It grows on gum trees, but on others also. The best method of eradication is to have the infested branches entirely removed and burned, as well as any young branches on which seedlings may have established themselves. Proclaimed under the Thistle Act for the whole State—October, 1904.

The Hanging Mistletoe.

Loranthus pendulus, Sieber. (Loranthaceæ.)

A glabrous shrub, parasitic on the branches of trees. Leaves mostly opposite, egg-shaped, or elongated, and of nearly equal breadth near base and apex; from 2 inches to 10 inches long, and sometimes even longer, seldom assuming a heart-shaped form. Flowers in axillary cymes; petals, usually five, elongated, soon spreading or bent back. Anthers adnate. Fruit brownish green, quite viscid (sticky); distinctly contracted at the summit. The Hanging Mistletoe is a native of Australia. Like the preceding one, this parasite is very destructive. Both, if not checked, spread over the trees and kill them, thus causing great loss in our timber resources. It is especially common on Eucalypti, but also grows on Acacias and other trees. The infested branches should be cut off and burned. Proclaimed under the Thistle Act for the whole State—October, 1904.

(To be continued.)

SUPPLEMENTARY LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES COLLECTED THROUGHOUT THE STATE UNDER THE PROVISIONS OF THE ARTIFICIAL MANURES ACTS 1904-5.

Sample No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen.		Phosphoric Acid.								Estimated Value per ton.	Where Samples obtained.
						Water Soluble.		Citrate Soluble.		Insoluble.		Total.			
			Found.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.		
			%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
16345	Superphosphate, Florida	Cuming, Smith, and Coy., Melbourne	6.59	..	..	19.63	18.00	1.34	1.50	0.47	1.50	21.44	21.00	4 14 0	Pyramid Hill
16495	" "	" " "	3.71	..	..	17.41	17.00	1.61	1.00	4.93	2.00	23.92	20.00	4 9 7	Cobram
16498	" "	" " "	9.85	..	..	19.58	18.00	0.65	1.50	0.10	1.50	20.33	21.00	4 10 9	Numurkah
16500	" "	" " "	11.44	..	..	18.86	18.00	1.73	1.50	0.83	1.50	21.42	21.00	4 12 6	Shepparton
16501	" "	" " "	9.41	..	..	19.40	18.00	1.44	1.50	0.63	1.50	21.57	21.00	4 13 7	"
16505	" "	" " "	9.19	..	..	19.37	18.00	1.53	1.50	0.51	1.50	21.41	21.00	4 13 8	Mooroopna
16506	Superphosphate, Nitro	" " "	9.46	1.06	(a)1.00	11.26	10.01	5.55	3.88	4.98	5.48	21.79	19.37	4 18 6	"
16507	" "	" " "	8.89	1.06	1.00	10.59	10.01	5.86	3.88	5.31	5.48	21.76	19.37	4 17 10	"
16518	" "	" " "	10.23	1.02	1.00	12.97	10.01	4.67	3.88	4.13	5.48	21.77	19.37	4 19 9	Beaufort
16533	" "	" " "	8.00	0.83	1.00	9.94	10.01	5.93	3.88	7.09	5.48	22.96	19.37	4 18 1	Nagambie
16843	" "	" " "	7.80	1.18	1.00	10.52	10.01	3.03	3.88	8.20	5.48	21.75	19.37	4 16 1	Ararat
16534	Bonedust and Superphosphate	" " "	9.86	1.60	1.50	7.67	7.50	7.37	5.00	5.93	8.50	20.97	21.00	4 18 0	Nagambie
16610	" " "	" " "	9.04	1.03	1.50	9.06	7.50	7.05	5.00	4.65	8.50	20.76	21.00	4 13 4	Euroa
16602	Thomas Phosphate ..	" " "	..	..	..	..	..	11.19	..	8.46	..	19.65	17.00	3 10 1	Benalla
16482	Superphosphate, No. 1	Mt Lyell M. and R. Coy., Melbourne	12.99	..	..	19.30	18.50	2.22	1.25	..	1.00	21.52	20.75	4 15 8	Tallygaroopna
16503	" "	" " "	12.25	..	..	18.88	18.50	2.35	1.25	1.00	1.00	22.23	20.75	4 15 3	Mooroopna
16511	" "	" " "	11.96	..	..	19.56	18.50	2.48	1.25	0.96	1.00	23.00	20.75	4 18 10	Tatura
16519	" "	" " "	12.65	..	..	19.15	18.50	2.24	1.25	0.67	1.00	22.06	20.75	4 15 9	Beaufort
16841	" "	" " "	11.91	..	..	17.46	18.50	2.06	1.25	3.54	1.00	23.06	20.75	4 19 2	Ararat
16546	" "	" " "	12.38	..	..	19.31	18.50	2.31	1.25	1.19	1.00	22.81	20.75	4 17 2	Rutherglen
16548	" "	" " "	9.78	..	..	21.65	18.50	0.85	1.25	..	1.00	22.50	20.75	5 0 0	Springhurst
16889	" "	" " "	11.81	..	..	19.32	18.50	1.28	1.25	3.08	1.00	23.68	20.75	4 15 0	Hamilton
16512	Superphosphate, No. 2	" " "	9.84	..	..	16.20	17.00	3.65	0.75	2.56	0.75	22.41	18.50	4 10 0	Tatura
16513	Superphosphate, Nitro	" " "	13.02	2.13	(b)1.60	15.80	16.00	1.97	1.00	0.59	0.75	18.36	17.75	5 7 5	"
16612	Bonedust and Superphosphate, No. 1	" " "	11.32	1.11	(a)1.30	17.61	13.50	1.52	3.75	3.16	4.50	22.29	21.73	5 5 11	Euroa
16457	Superphosphate, Standard Brand	Renard Fertilizer Coy., Melbourne	10.51	..	..	16.70	17.00	1.40	1.50	0.50	0.50	18.60	19.00	4 1 2	Nathalia
16460	" " "	" " "	7.02	..	..	16.25	17.00	3.38	1.50	0.36	0.50	19.99	19.00	4 6 11	Wunghnu
16509	" " "	" " "	10.24	..	..	15.83	17.00	3.61	1.50	0.64	0.50	20.08	19.00	4 6 3	Tatura
16858	" " "	" " "	9.19	..	..	16.70	17.00	3.53	1.50	0.77	0.50	20.00	19.00	4 19 0	Willaura

(a) Nitrogen calculated as in bone manure.
(b) Nitrogen calculated as ammonia, 1 per cent.; as in blood manure, 1.13 per cent,

SUPPLEMENTARY LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES—*continued.*

Sample No.	Description of Manure.	Manufacturer or Importer.	Moisture. Found.	Nitrogen. Found.	Nitrogen. Guaranteed.	Phosphoric Acid. Water Soluble. Found.	Water Soluble. Guaranteed.	Citrate Soluble. Found.	Citrate Soluble. Guaranteed.	Insoluble. Found.	Insoluble. Guaranteed.	Total. Found.	Total. Guaranteed.	Estimated Value per ton.	Where Samples obtained.
			%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
16510	Superphosphate, Standard B Brand	Renard Fertilizer Coy., Melbourne	11.28	..	..	13.07	12.75	3.85	1.30	1.06	0.24	17.98	14.29	3 15 1	Tatura
16554	Thomas Phosphate, Standard Brand	" " "	..	..	..	..	..	10.24	..	7.65	..	17.89	17.17	3 3 10	Wangaratta
16485	Bonedust and Superphosphate, Standard Brand	" " "	7.10	0.98	(a) 0.90	8.38	12.75	9.94	4.25	4.00	2.31	22.32	19.31	4 19 5	Shepparton
16531	Superphosphate, Wischer's	Wischer and Coy., Melbourne	4.60	..	..	20.12	18.00	0.95	1.50	1.20	1.50	22.27	21.00	4 15 5	Nagambie
16605	" "	" " "	6.55	..	..	17.47	18.00	1.67	1.50	2.49	1.50	21.63	21.00	4 7 8	Violet Town
16859	" "	" " "	6.30	..	..	18.38	18.00	2.06	1.50	2.36	1.50	22.80	21.00	4 13 2	Willaura
16614	Bonedust and Superphosphate	" " "	7.02	0.88	(a) 0.90	11.68	12.00	4.65	3.00	3.44	4.00	19.77	19.00	4 10 4	Euroa
16502	Superphosphate, No. 15	Australian Explosives and Chemical Coy., Melbourne	7.82	..	..	8.25	13.20	7.63	0.20	1.49	1.10	17.37	14.50	3 9 0	Mooroopna
16525	Superphosphate, Federal O. S.	" " "	8.83	..	..	18.28	18.00	1.99	1.50	0.89	1.50	21.16	21.00	4 11 2	Ballarat
16856	" " "	" " "	6.65	..	..	19.41	18.00	3.32	1.50	1.03	1.50	23.86	21.00	5 17 0	Willaura
16432	Superphosphate, Nitro	Colonial Manures Coy., Melbourne	1.02	1.30	(c) 0.60	8.36	10.00	3.86	5.00	6.06	2.50	18.28	17.50	4 9 8	Spencer-street Railway
16459	Superphosphate, No. 1	" " "	11.25	..	..	16.82	17.50	1.35	1.00	..	..	18.17	18.50	4 1 4	Wunghnu
16604	" "	" " "	11.29	..	..	16.23	17.50	1.96	1.00	..	..	18.19	18.50	4 0 10	Violet Town
16615	" "	" " "	11.86	..	..	16.96	17.50	2.31	1.00	0.19	..	19.46	18.50	4 5 7	Euroa
16603	Thomas Phosphate ..	" " "	..	..	..	..	..	11.44	..	9.89	..	21.33	18.00	3 15 5	Violet Town
16857	" " ..	" " "	..	..	..	..	..	13.35	..	7.09	..	20.44	18.00	3 14 7	Willaura
16607	Bonedust and Superphosphate	" " "	8.98	0.80	(a) 1.00	15.07	12.00	3.88	4.00	1.85	2.00	20.80	18.00	4 17 1	Violet Town
16522	Superphosphate, Hasell's "Jap"	A. H. Hasell, Melbourne	11.30	..	..	17.38	18.50	2.80	1.50	0.26	..	20.44	20.00	4 9 7	Ballarat
	" " "	" " "	8.06	..	..	21.23	18.50	1.19	1.50	..	..	22.42	20.00	5 0 3	Burwood
	" " "	" " "	9.04	..	..	21.00	18.50	1.16	1.50	..	..	22.16	20.00	4 19 1	Melbourne

(*a*) Nitrogen calculated as in bone manure.
(*c*) Nitrogen calculated as ammonia.

SUPPLEMENTARY LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES—*continued.*

No. of Sample.	Description.	Manufacturer or Importer.	Nitrogen.		Phosphoric Acid.		Mechanical Condition.				Estimated Value per ton.	Where Samples obtained.
							Fine.		Coarse.			
			Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.		
			%	%	%	%	%	%	%	%	£ s. d.	
16561	Bonedust	J. Cockbill, Melbourne ..	3.94	3.50	20.32	18.25	41.14	..	58.86	..	5 9 0	Wangaratta
16528	"	Heinz Bros., Ballarat ..	3.94	3.12	18.94	19.38	62.55	..	37.45	..	5 9 9	Ballarat
16516	"	Cuming, Smith, and Co., Melbourne	2.96	2.50	21.09	21.00	37.50	..	62.50	..	4 19 6	Beaufort
16608	"	" "	2.77	2.50	21.00	21.00	52.75	..	47.25	..	5 1 0	Euroa

W. PERCY WILKINSON,
Government Analyst for Victoria
and
Acting Chemist for Agriculture.

Government Laboratory,
12th May, 1906.

DISEASES OF FARM ANIMALS.

S. S. Cameron, M.R.C.V.S.

V.—NOTIFIABLE DISEASES UNDER THE "MILK AND DAIRY SUPERVISION ACT 1905."

(*Continued from Page* 420.)

Contagious Abortion in Cattle.

(Slipping Calf or "Slinking.")

Abortion, by which is meant the birth of the calf at any stage of development prior to the mature period of gestation, may occur as a result of accidental incidence of external forces, or may be directly due to contagion. It is true that any of the usual causes of accidental abortion may co-operate with the contagious element, and so increase the severity of the outbreak, and it is doubtless equally true that the occurrence of accidental abortion may be the starting point of an outbreak of contagious abortion, but as a rule the two forms can be sharply defined by inquiry into the surroundings and history of the case. That they should be so defined is of great practical importance; otherwise, through neglect of precautions which are necessary in the one case, but immaterial in the other, a ruinous disease may gain so strong a hold of the herd as to involve great cost and inconvenience in its eradication.

ACCIDENTAL ABORTION.

Amongst the causes of accidental abortion, the following may be enumerated:—Mechanical injuries which result in the death of the unborn calf (fœtus), and its detachment from the membranes of the womb, such injuries, for example, as are sustained through fence-jumping, being kicked or crushed in trucks, races, yards, or otherwise, hounding with dogs, jumping of other cows when "bulling," over-driving, and the like forms of external violence; ergotized grasses, smut and bunt or other forms of mould growth on fodder; fermentescible foods, such as clover, lucerne, and sorghum, eaten in immoderate quantities, and so causing "hoven" and bowel disturbance; foul, putrescent drinking water; the eating of frozen foods or the drinking of ice-cold water; severe constipation or bowel disturbance, or the administration of powerful purgatives, all causing excessive straining; the eating of irritant plants, such as savin, rue, and tansy; mental excitement, such as is caused by the sight or smell of blood, carrion, or other strange and terrorising objects; and finally many constitutional diseases, cows affected with pleuro-pneumonia or other disease accompanied by high fever being very liable to abort.

The precautions to be adopted after accidental abortion from any of the above causes are: First, the isolation of the aborted animal from other in calf cows for a period of a fortnight, or until all discharge has ceased, and the womb and genital passages have regained their normal condition. An aborted cow should not be bulled for at least three months after abortion. Second, the burning of the discharged fœtus and "cleansing" of fœtal membranes, and the daily burning of any clots or discharges

that are passed. The cow may be given a laxative drench composed of 12 ozs. of Epsom Salts, 2 ozs. of sulphur, and 1 oz. of ginger in a quart of warm gruel; and, as local treatment, the womb should be syringed out two or three times at daily intervals, or oftener and for a longer period if the discharge is foul-smelling, with a luke-warm antiseptic solution, say, one tablespoonful of Creolin or Lysol or Jeyes' Fluid to 2 quarts of blood-warm water.

CONTAGIOUS ABORTION.

This may be defined as a disease of the womb—an infectious catarrh of the lining of the womb (uterus), resulting in the premature expulsion of the fœtus, and caused by the transmission from one animal to another of the specific germ of the disease. When introduced into a herd the disease assumes the character of an outbreak or epizootic. It is usually so introduced by a cow or bull from a herd in which the disease exists, and the chance of getting the complaint is one of the risks of buying cattle from unknown sources at sale-yards and auctions. Or it may be introduced by sending a cow from a healthy herd to a bull that has previously served aborting cows, or by grazing cows in a paddock in which others have aborted, or by any cattle traffic between an aborting herd and sound cattle. The infecting material is present in discharges and smears on the tail and quarters, and it may be conveyed by contact with infected bails, fences, rubbing posts, litter, attendant's clothing, or other such means. The disease has been repeatedly conveyed experimentally by inserting into the vagina of a healthy in-calf cow a small piece of cotton-wool smeared with the discharge from an aborted cow, or which had been previously inserted for a few minutes into the vagina of such a cow. Moreover, as showing that the causative germ is the same in all animals, the disease has been conveyed in the same way to the sow, ewe, goat, rabbit, and guinea pig, and mares, bitches, and cats can be infected if the virulence of the germ is intensified somewhat, as it appears to be by passing it through an intermediate host, such as the rabbit, instead of inoculating direct from the cow. Such experiments leave no room for doubt that the disease is a contagious one, and the conclusion is supported in a practical way by the beneficial results which follow on an antiseptic or germicidal method of treatment. In herds in which abortion has been prevalent for years the disease may be entirely suppressed by the adoption of this line of treatment.

The actual causative germ has not as yet been agreed upon. Organisms have been found by many investigators associated in the genital membranes, passages, or discharges in such a way as to indicate their connexion with the disease, but different observers have ascribed the causative agency to germs showing differences in structure or other identifiable characters, so that no agreement has been arrived at. There is, however, a consensus of opinion that the germ propagates in the womb and genital passages.

Bang, of Copenhagen, claims to have isolated an organism from cases of abortion, by means of which, after artificial cultivation, he has produced the disease experimentally.

There are some interesting facts in connexion with the experiments and observations made concerning this disease which have a practical bearing on its causation and prevention. One is that in the experimental production of the disease the abortion usually occurs at from nine to twenty-one days from inoculation, but the period may be lengthened if the cow

experimented on is in an early stage of pregnancy, or shortened if in a late stage. The period when abortion most often occurs is between the third and seventh month, so that if the infection is contracted at the time of "serving" it is evident that the period of incubation is longer than when it is conveyed experimentally, and hence no definite idea of the average period of incubation of the disease has been arrived at. The calves of aborting cows if born alive are usually delicate, and die of broncho-pneumonia or intestinal derangement within a few days of birth, and as they are undoubted sources for the transmission of the disease, it will be safer in all cases to destroy them at birth, and burn the carcasses along with the membranes and discharges.

Temporary sterility is a condition often associated with the tendency to abort. The cow takes the bull at frequent intervals, and fails to conceive. *In the 1904 annual report of the New Zealand veterinary branch* there is reported the case of a herd of thirty-two Shorthorn cows, the property *of Archdeacon Williams, Te Aute, New Zealand, all of which had* been barren for one to three years, as a result of an invasion of contagious abortion. *In these cases there is apparently a chronic condition of* catarrh of the womb, and if conception does take place, abortion occurs within a few months. Cows that have once aborted are very liable to abort again if they conceive, although in some cases it has been noticed that after two or more abortions the animal appears to acquire an immunity against abortion, and will carry her calf the full period, even though cows that have not previously aborted are aborting all round. In cases of repeated abortion in the same cow, it has been observed that the calf is carried longer each time, until the full term is reached, but the presence in the herd of an aborting cow is such a menace to the remainder that it is unwise to give such a cow the chance to acquire immunity. She should be fattened for the butcher, and cleared off the place.

PREVENTION AND TREATMENT.

The disease being transmitted by some germ which propagates within the womb and genital passages, every cow that has recently aborted, or that shows signs of impending abortion, ought to be regarded as a disseminator of the disease; and the consequent necessity of complete isolation of such animals from the remainder of the herd is self-evident.

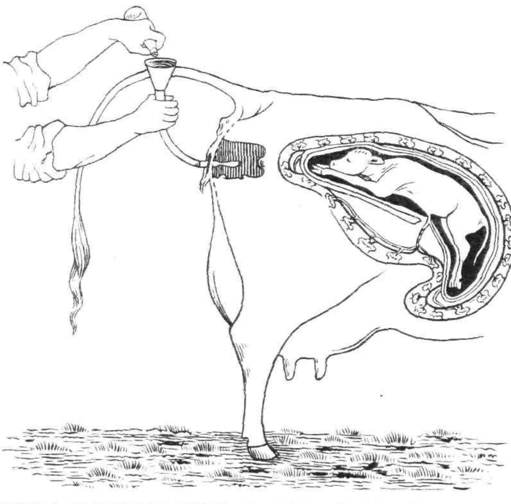
The success of the antiseptic or germicidal method of treatment will largely depend on the thoroughness with which the following details are *carried out. As previously stated, the calf-membranes, and discharges,* as well as all litter soiled by these, should be destroyed by burning. If the cow has aborted in the paddock it is absolutely essential that the fœtus should be searched for. If not found and burnt, it will certainly be "fossicked out" by other cows and infect them.

The womb and genital passages of the aborted cow should be irrigated with one of the following antiseptic solutions:—

1. Carbolic acid, 1 part; sodium carbonate, 1 part; water, 100 parts.
2. Creolin or Lysol, 1 part; water, 100 parts.
3. Corrosive sublimate, 1 part; common salt, 10 parts; water, 2,000 parts.
4. Biniodide of mercury, 1 oz.; iodide of potassium, 4 ozs.; water, 20 pints.

(*No. 4 solution to be diluted 1 part to 20 of warm water when required* for use.)

About a gallon of the antiseptic solution should be injected once daily for at least a week, and it is an advantage if it can be raised to blood heat before injection, so that the straining often induced by flooding with cold solutions may be avoided. An ordinary cattle enema syringe may be used, or a piece of hose piping may be inserted, and the solution poured or allowed to flow into it through a funnel, from a height sufficient to guarantee pressure enough to force the fluid into the furthermost recesses of the calf-bed. Where a number are to be injected, the solution may be kept in a barrel or vessel elevated on a framework, and the hose may have a pressure-cock attached to it, so that the amount of fluid injected may be regulated.



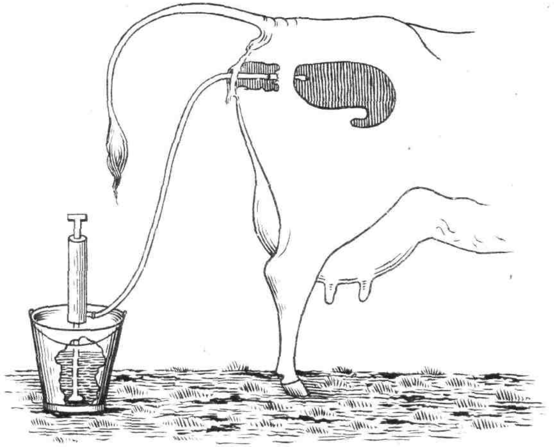
METHOD OF IRRIGATING VAGINA OF IN-CALF COW AS A PREVENTIVE OF ABORTION.

But the eradication of the disease will not be effected by the treatment of individual cows that have aborted, or even of those that fail to hold the bull. The whole of the cows, or at all events, all the pregnant ones in the herd, must be subjected to similar treatment, for it must be borne in mind that when a cow aborts the germ has probably been propagating within the genital organs for some weeks previously, and that long before abortion actually occurs such a cow may be a disseminator of the disease by germs passed out with the discharges from the genital passages. In injecting pregnant cows care must be taken that the fluid is not forced

into the womb, but only so far as the neck of that organ. One irrigation of pregnant cows will probably suffice, but until the outbreak has been completely overcome every cow in the herd ought to have the external parts and tail sponged daily with the germicide solution.

Aborted cows usually come "bulling" a few days after aborting, and, if then served, almost invariably abort again. Service should not be attempted for at least three months, during which time the germicidal treatment should be carried out.

The treatment of the bull that has been used with aborting or sterile cows is also an essential part of the eradication process. His sheath, and, if possible, the urethra of the penis, should be freely sluiced at



METHOD OF IRRIGATING UTERUS OR CALF BED OF NON-PREGNANT COW.

intervals with the antiseptic solution. To do this effectively, and without danger, it will be necessary to have the bull in a crush-pen, with his legs shackled, or to throw him. An ordinary human enema syringe, such as may be procured at any chemist's, may be used to irrigate the sheath.

Finally, cleanliness in the milking shed and surroundings is most important. The floors and lower parts of walls should be thoroughly cleansed at least once a week, and afterwards heavily sprinkled with bluestone (sulphate of copper) of a strength of 6 ozs. to the gallon of water, or some other effective disinfectant.

It is important, and will prevent discouragement, to remember that no treatment is likely to completely rid a herd of the infection in the course

of a single season, for when once a number of cases have occurred the disease is certain to be already in progress in the system of some of the remaining cows, although these may not at the time show any symptoms, and when the germ has gained access to the pregnant womb, no remedial or preventive treatment can be efficacious. The treatment above sketched out must, therefore, be consistently carried out for two seasons, and the fact that a few cases occur during the second season need not excite despair.

As indicating the enormous monetary loss that may be suffered by allowing the contagious form of abortion to spread unchecked throughout a dairying country, the following statements by Mr. J. A. Gilruth, M.R.C.V.S., chief Government Veterinarian of New Zealand, in an official bulletin on this subject, issued in 1905, may be quoted:—"I said last year that this disease was the cause of an annual loss of £100.000 to the Colony (N.Z.). In the light of the fuller information since received, I now assert that the loss is more than twice that sum." And again:—"Our experience shows that this disease is costing the Colony (N.Z.) from £200.000 to £300.000 per annum, an estimate based on the increased milk yield that would result from its eradication."

In Victoria, statistics as to the extent to which abortion and sterility prevail are not available, and estimates as to its prevalence in different districts vary considerably. Some herds are known to have been affected to the extent of 40 and 50 per cent., but an estimate of a 10 per cent. prevalence throughout the State would probably be very near the mark. Basing calculations on a 5 per cent. prevalence, however, it is found that the annual loss to the dairying industry through cows being out of profit from this disease approximates to a quarter of a million sterling.

Under the *Milk and Dairy Supervision Act*, 1905 contagious abortion is a notifiable disease, and it is anticipated that when the information that will be obtained as a result of notification is available, a comparatively reliable estimate of the prevalence of the disease in this State may be made.

Contagious Mammitis in Cows.

The prevalence of this disease amongst dairy stock in Australia was first announced in an address by the author before the Victorian Chamber of Agriculture at its 1905 Convention. Contagious mammitis has obtained a fairly wide spread throughout the dairy herds in Victoria, and is probably, in a large measure, accountable for much of the difficulty experienced by butter factory managers in maintaining uniformity of quality in their manufacture. This, because of the fact that the milk from one herd, or even from one cow, will serve to contaminate a whole "batch" of milk or cream, rendering it (as will be explained later) unsuitable for butter manufacture, on account of excessive acidity and curdiness. When the affection becomes at all wide-spread in dairying areas, the loss of the milking function of one or more quarters which the disease so often entails is a matter sufficiently grave to rouse reflections as to the serious financial loss the dairying industry sustains. The disease is also a grave one from a public health point of view, for in England and other European countries epidemics of sore throat and scarlatinal affections have been traced, beyond doubt, to the drinking of milk from herds affected with contagious mammitis. At Finchley (England), during an epidemic of sore throat, the germ of this disease was found in the throats of affected persons.

In New Zealand the affection has been the subject of thorough scientific inquiry by the Chief Government Veterinarian (Mr. J. A. Gilruth, M.R.C.V.S.) and his professional staff.

The CAUSE of the disease is a germ called the *streptococcus mammitis bovis*, belonging to the same family group as the ordinary pus-forming organism (*streptococcus pyogenes*), but possessing bacteriological characteristics by which it may be easily distinguished from the latter. One of these is that when introduced into milk it rapidly causes acidity and complete coagulation or clotting, within from eighteen to thirty-six hours, "the whole of the material becoming a mass of curd, with the smallest quantity of whey imaginable—a condition which, so far as I am aware, entirely differentiates this *streptococcus* from other organisms of the same germs." (*Gilruth*).

The disease is spread from farm to farm by the usual means of inter-farm traffic in cattle per medium of the sale-yard. It is suspected also that it may be taken on to a farm by means of contaminated separated milk received from a creamery or butter factory. If this is so, it furnishes one of many reasons why the milk of different owners should not be mixed at factories, and why the supplier should have only the separated milk from his own whole milk returned to him, or, alternately, it is a strong argument (as is also infection of bulk milk, by mixing, with tubercle germs) in favour of the sterilization of mixed separated milk at the factory before return to the owner. From cow to cow in the same herd the disease is spread by the hands of the milker, especially when the filthy habit of wet milking is practised, and when the milker's hands are not washed between milkings. The use of the milking machine is also a means of spread from cow to cow, it being next to impossible in practice to get the teat cups disinfected after the milking of each cow. Cows milked by machine are notoriously subject to sore udder (one herd may be cited in which 40 per cent. of the cows were so affected), and it is likely this is not so much due to mechanical effect as to the transmission of the germs of contagious mammitis by means of the teat cups. The infection from a diseased quarter to other healthy quarters of the udder of the same cow is brought about by the same means. On these points Gilruth's experiments were interesting and conclusive. They showed that, by ordinary milking methods, the disease was transmitted (within five days) to that quarter of the udder which was milked with the same hand as the diseased quarter. It would seem that the actual introduction of the germ into the quarter takes place through the orifice of the teat, whose surface has been contaminated by the germ-laden milk from the diseased quarter.

NATURE, COURSE, AND SYMPTOMS.

The disease is essentially a local one, confined to the udder, and the cow's general health is seldom appreciably affected. It is a slow, chronic form of catarrhal inflammation of the milk-bearing ducts of the udder. Three forms, or stages, of the disease are described, viz., acute, sub-acute, and chronic, in all of which the specific *streptococcus* has been found. These three forms may occur successively in the same cow, or any one of them may alone be existent.

In the *acute* form the onset is indicated by a diminution of milk yield from the affected quarter, followed by a tendency in the milk from that quarter to turn sour and coagulate much more rapidly than normal milk. A slight swelling or hardening of the teat duct may be felt, extending

up to the base of the teat, at which there is a hard fullness or nodulation. "Shortly after these early symptoms are exhibited, the milk becomes viscous, thick, and yellowish, being more of the nature of pus—which, in point of fact, it is—than milk. Gradually it assumes a dirty brownish tint, is more curdly, and if the material be collected and allowed to stand, one-quarter to four-fifths settles as a dirty brownish-yellow deposit, surmounted by a thin, pale milky fluid. The deposit, under the microscope, is seen to consist of masses of pus cells mixed with *streptococci*. Gradually the secretion of the quarter diminishes until only a few spoonfuls of the dirty-looking, purulent material can be removed, the teat duct becomes sensibly thicker, and if little attention be paid it becomes impervious, and the whole quarter rendered useless."

"The *sub-acute* form is in reality more dangerous than the foregoing, as the changes occur so slowly, and the secretion of milk is so slightly altered, that it remains frequently unobserved until too late, generally resulting in a 'blind quarter' the following year. Practically the only alteration observed in the affected quarter is a more or less marked thickening of the walls of the teat duct, the feeling being to the hand as if a piece of cord had been inserted into the canal. The disease is, therefore, purely local, and confined to the teat duct, and probably the floor of the 'milk cistern' or lactiferous sinus. Beyond the first small quantity of secretion removed on milking, the milk is little altered—so far as casual observation goes. The quantity first removed, however, is generally yellowish, curdly, and, in fact, purulent. This, however, is sufficient to contaminate the hand and the whole of the milk, and the remainder, passing, as it does, over the diseased catarrhal surface, carries away a further number of germs. Therefore, even if the first quantity be milked on to the floor, as is often done by the milker, the bulk is always contaminated to a greater or less extent."

"Gradually this phase of the disease is followed by the *chronic* form, which is manifested by the development of one, and sometimes two, hard nodules within the teat-duct, generally towards the base of the teat or its upper third. This nodule is usually about the size of a pea, though it may assume the dimensions of a walnut. This condition is sometimes spoken of by dairymen as a 'pea' or 'wart' in the teat."—(*Gilruth.*) Frequently the nodulated condition develops during the time the cow is dry, before calving, causing a previously sound udder to be blind in one or more quarters at the subsequent calving.

TREATMENT AND PREVENTION.

The treatment that has proved most effective up to the present has been the injection of boracic acid solution (1 part boracic to 20 parts warm water) into the affected udder through the teat-duct, by means of a metal teat tube and rubber syringe. About a quarter of a pint of the solution should be injected once daily, and a cure may be expected in the course of a fortnight if the case is in the acute form or early stage. For the chronic cases, where the teat-duct is "corded" or nodulated—"pea" in the teat—no treatment as yet carried out seems to be of any avail in restoring the normal function of the udder. It will be obvious that cows with sound udders should not be milked by the same persons who milk those affected; and further, that the milker's hands should be cleansed and disinfected (by washing in boracic acid solution, strong soda suds, or other antiseptic), not only between milking each cow, but also between

the drawing of each pair of teats, so that spread from one quarter to another may be avoided. In a small herd where only one milker is available, the affected cows should be left until the last. Milk from an affected quarter should be milked into a separate vessel, and subsequently boiled before being put to any use. It should also be superfluous to point out the advisability of examining the state of the udder, and of trying all the teats before purchase of dairy cows, with the object of determining the perfection or otherwise of the quarters.

GARDEN NOTES.

J. Cronin, Inspector Vegetation Diseases Acts.

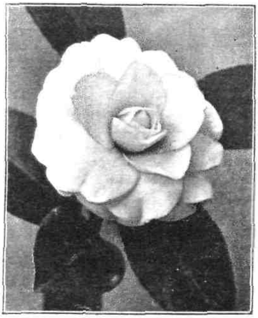
The Camellia.

The camellia is a handsome ever-green, winter-blooming shrub, found native in China and Japan. The florists' varieties have been produced chiefly from *Camellia Japonica*, a species that was introduced into England from China in 1739. This species is described as a lofty shrub or small tree, found growing wild in woods partially shaded from the sun by other trees. Robert Fortune mentions several varieties that he saw in the Central and Southern provinces of China, which had attained a height of from 30 to 40 feet. Some time after the original importation, severals forms or varieties of *C. Japonica*, that produced flowers of varying colours and forms, were introduced into European gardens, and it was from these principally that the fine varieties now grown in our gardens were raised. In addition to *Camellia Japonica*, *C. sasanqua* and *reticulata* are worthy of cultivation, both of which species are included in the fine collection grown at the Melbourne Botanic Gardens. In this State the camellia is easily grown in the cool districts, where, when thoroughly established, it endures extremes of cold, heat, and drought. In the gardens in the metropolitan district, shelter from large trees or trellis is usually provided, and fine specimens may be seen in many of the large gardens and nurseries. In the warm districts, shade conditions are necessary to grow them. The principal point of value in camellias is their blooming when most trees and shrubs are without flowers or foliage. In a fair collection, embracing early and late varieties, some of the plants will be in flower from June till September.

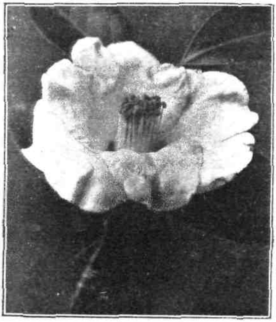
Most of the plants purchased from nurserymen are grafted on seedlings from single varieties. This grafting requires a heated glass-house to insure success. Cuttings of some varieties will form plants under special conditions, but this method is not often practised, being very slow and uncertain. Layering is the most certain and easy means of increasing camellias. The process differs little from that recently advised for carnations, except that the soil should be more carefully prepared. The layers require to be attached to the parent plant, and attended to in watering, &c., for a full growing season at least. Some varieties need two years to form a sufficient root system to insure free, healthy growth in the young plants. In preparing soil for the reception of layers—practically cuttings only partly separated from the parent plant—no manure should be used. A light, sandy, and porous compost is necessary. The shoots should be securely

pegged down to prevent any chance of their being disturbed when cultivated. During spring is the best time to layer camellias, and free growing shoots of the previous season are most likely to make good plants. They require to be kept moist during dry, hot weather.

A fairly friable loam, enriched with well-rotted cow or sheep manure, and thoroughly drained, will suit camellias well. The best manure to apply to soil around large plants is bonedust. A light dressing should be applied, and lightly forked in during winter. A situation sheltered from north winds and full sun in summer is most suitable. In districts subject to severe frost a low situation should be avoided, or the flowers will be spoiled. At Wandin, the plants do well where lemons fail, owing to frost. In that district, too, they endure heat and bad cultivation, and in the proper situation, are as hardy as a laurestine.



DOUBLE FLOWERED TYPE.
"ALBA PLENA," WHITE.



SINGLE FLOWERED TYPE.
SEEDLING, WHITE.

One of the most important points in camellia culture is the need of planting carefully. The plants, if taken from pots, should be set out with the surface roots at the settled level of the surface soil. If planted too deeply they rarely succeed. Temporary shelter should be provided for the first summer, after which they may be expected to endure normal summer conditions. In cultivating the soil about camellias, deep working should be avoided at all seasons. Digging among the roots should never be attempted, as most of the feeding roots are near the surface, and would inevitably be destroyed. A light skimmering of the surface and a top-dressing of sweet, good soil is all that is necessary in the way of cultivation. The plants need a fair amount of water during summer. The only pruning needed is the removal of any parts that will tend to make the plants crowded with shoots, or ill-balanced. Black scale is common on camellias in Melbourne and district, though rare in country districts. An occasional spraying with kerosene emulsion or resin compound will rid the plants of this pest.

The principal varieties are as follow:—

Imbricated exhibition kinds:—White, "Alba plena," "Fimbriata," "Isabella," "Bonomiana," "Mathotiana alba"; red, "C. M. Hovey,"

"C. H. Hovey," "Rafia," "Mathotiana," "William Bull"; pink. "Storyii," "Mrs. H. Boyce," "Lady St. Clair," "Harriet Beecher"; marbled and striped, "Wrightii," "Giovanni Santarelli," "Carlotta Papudoff." Other forms:—"Aspasia," "Waratah," "White Waratah." *Sasanqua* and *reticulata*.

Flower Garden.

Digging, pruning, &c., should be completed without delay. This applies specially in places where a plentiful supply of water is not available. Before the warm weather begins, cultivation to conserve moisture should be well in hand, and the first step in that direction is the breaking down of the rough exposed surface left after digging. Pruning of roses and other plants should be finished early in the month. Deferring it will tend to check the plants initially, and afterwards to expose them to weather conditions calculated to reduce the vigor of the spring growth.

Ground should be prepared for annual and herbaceous plants. Last August special reference was made to the preparation of seed beds, sowing, &c. Shortly, the most important items are:—Reduce the soil to a condition of fineness, sow the seeds very thinly if the plants are to flower where the seeds are sown, cover the seeds with light soil according to their size—large seeds, as lupins, to an inch; smaller, as pansy and phlox, merely cover. The soil should be pressed firmly over the seeds and watered lightly.

Divisions of herbaceous plants may be set out in their flowering quarters. The ground should be well manured for such as Canna, Helianthus, herbaceous Salvia, and others that make a deal of growth during the season.

A common query is—What is the best time to re-pot palms and such-like plants? The need to re-pot such plants only arises when the pots are full of roots, or when the soil is sodden and sour. Spring is the most suitable time for re-potting plants used for room and table decoration. In a glass-house any time but winter is suitable. A mistake is often made by over-potting, *i.e.*, using pots too large for the plant. Slow-growing plants, like many palms, camellias, &c., should not be transferred to pots much larger than those they previously occupied. A move from a pot 5 inches in diameter to one 7 inches in diameter is quite sufficient. Rapid-growing plants, such as coleus, will need to be re-potted two or three times during the season. In potting plants only clean pots should be used; these should be well drained, especially if the plants are likely to remain in them for some time. Moderately moist soil, porous in character, and of the nature the plants require, should be ready for use. The plant to be re-potted should not be dry. After being removed from the pot the old crocks should be taken away, and (if pot-bound) the roots carefully disentangled. Some soil should be placed over the drainage material, and the plant placed on the soil a little below the level it occupied in the smaller pot. Soil should be added, and pressed firmly between the ball of soil and the pot until the required level is reached. Except in hot weather, the newly-potted plant will not require much water for a time, but will be benefited by an occasional syringing over the foliage, and extra shade. Pot plants fail often through being placed on exposed stands, at some height from the ground. The less the air circulates under and around the pots the better for most plants.

Kitchen Garden.

Where ground is in readiness, a variety of vegetables for summer and autumn use may be planted, or seed sown. From former sowings, onion, cabbage, cauliflower, and other plants may be transplanted. Seed may be sown of various roots, as carrots, parsnips, beet, &c., also peas and broad beans for succession. Cabbage, cauliflower, and onion seed may be sown for transplanting later, and early potatoes planted. If a hot-bed frame is available, cucumber, melon, tomato, and celery seed may be sown for early use.

BLACK SPOT EXPERIMENTS, 1905-6.

D. McAlpine, Vegetable Pathologist.

Having been requested to test the efficacy of Little's Fluid Dip as a spray for Black Spot of the apple, I carried out experiments for this purpose at Mr. Hatfield's orchard, Box Hill, with the variety known as "Yates," which is rather susceptible to this disease. The trees chosen for experiment were, as nearly as possible, equal in size, vigour, and age, and the dip was used in two strengths of 1 in 120, and 1 in 160 respectively. Trees were left unsprayed alongside to serve as a check, and the following sprays were also used for comparison:—

Bordeaux Mixture.
Copper Soda.
Phenyle (1 in 160).
Phenoline (1 in 160).
Crude Carbolic (1 in 160).
Oil of Tar (1 in 160).

The spraying was done at the end of October owing to the lateness of the season, and there was a sufficient development of Black Spot to allow of comparisons being made between the different sprays.

When the fruit was ripe, it was carefully weighed from each tree, and sorted out, separating the clean from the spotted. The details are given in the accompanying table, from which it will be seen that, while the unsprayed trees yielded 3.7 per cent. of absolutely clean fruit, those treated with Little's Fluid Dip (1 in 160) gave 3 per cent., and 1 in 120 gave 1.4 per cent. The result for this season was, that trees sprayed with Little's Fluid Dip had actually less absolutely clean fruit than unsprayed trees. Bordeaux Mixture and Copper-Soda yielded, respectively, 28.6 and 37.5 per cent. of absolutely clean fruit, while the marketable fruit—that not sufficiently spoiled to be unsaleable—was 99½-100 per cent.

DETAILS OF EXPERIMENTS.

Treatment.	Absolutely Clean.	Slightly Spotted.	Unmarketable. Badly Spotted.	Total.	Per Cent. clean.	Per Cent. Marketable.
	lbs.	lbs.	lbs.	lbs.		
Little's Sheep Dip (1 in 120) ...	½.	33	1½	35	1·4	95
,, ,, ,, (1 in 160) ...	2	63	1½	66½	3·0	98
Check	2½	61	4	67½	3·7	95
Copper Soda, 6.8.40	27	45	..	72	37·5	100
Bordeaux Mixture, 6.4.40 ..	25	57	½	82½	28·6	99½
Phenyle (1 in 160)	1¾	38	2½	41¾	1·6	94
Phenoline (1 in 160)	2	61	5	68	3·0	93
Crude Carbolic (1 in 160) ...	2	63	5½	70½	2·8	92
Oil of Tar (1 in 160)... ...	2	57	5	64	3·1	92

FOURTH CONVENTION OF THE VICTORIAN CHAMBER OF AGRICULTURE, JULY, 1906.

I.—IMPROVEMENT OF VICTORIAN PASTURES.

T. Cherry, M.D., M.S., Director of Agriculture.

There is no question of more importance to Victorian agriculture than that of the improvement of the pastures. In this lies one of the chief means of increasing the number of live stock that can be carried on any farm, and the number of live stock is the true measure of the agricultural resources of the State. Not only is it necessary to have good pastures to carry the live stock, but, as will be seen later on, the two go hand in hand. Rich pastures mean large herds, and, conversely, large herds mean rich pastures. In securing rich pastures, however, there are two factors—the soil and the rainfall; and, while our soils may be rich enough, the deficiency in the rainfall makes the question of improvement more difficult than it is in Europe or America. As far as Victoria is concerned, we must draw a distinction between the parts of the State that have a rainfall of more than 25 inches and those that have less. The 25-inch line begins at the South Australian Border north of Casterton, sweeps round the north of the Grampians to Hamilton, then passes diagonally to Mortlake, and thence along the railway line to Melbourne. From Melbourne it encircles the Keilor Plains, and skirts the hills round Ballarat to Clunes, and thence bears eastward, near Castlemaine and Heathcote, to Seymour, whence it follows the railway line to Wodonga. There is also a three-cornered part of the State, near Sale, with less than 25 inches, so that we may say that by far the greater part of the grazing land in Victoria has too little rainfall to make the establishing of permanent pastures an easy matter. Moreover, the same conditions make it difficult to get a good stand of pasture grasses, however carefully the land has been prepared. In Gippsland or the Otway country grasses and clovers will come luxuriantly after a burn-off, the seed being simply sown on the ashes, but few people have managed to make even a lawn successfully in many other districts. Another difficulty lies in the fact that none of our natural grasses are really good drought resisters—differing in this respect markedly from our shrubs. The shrubs nearly all have deep tap roots, while this characteristic is, I believe, almost unknown among the grasses. The attempts that have been made to lay down large areas with artificial grasses have not hitherto been very successful, outside the region of heavy rainfall.

To test what can be done towards improving our pastures at a moderate cost, the Department last year treated 30 pasture fields, of from five to ten acres each, in the following manner:—The field was harrowed, when soft enough, with a heavy straight-tooth harrow, so as to scratch the surface fairly deeply. Half-a-crown's worth of mixed clovers were then sown, and the same value in artificial manures applied in strips, as under—1. superphosphate; 2, potash sulphate; 3, bonedust; 4, gypsum; 5, Thomas' phosphate; 6, lime. Each plot comprised an area of about an acre and a quarter. As the edges of each strip of the manures were allowed to overlap by 20 feet, this arrangement gave us eleven experiments on the same plot.

All the districts of Victoria were represented except the far north, but the localities were chosen to represent the medium to inferior quality as far as the soil was concerned. Owing to the exceptionally unfavorable weather experienced last spring and summer, the results have not been so good as we might reasonably have expected, but reports from ten of the fields, received last March, show that sufficient has been achieved to warrant further experiments in this direction. In all these cases, the plots which have done best are those manured with superphosphate, superphosphate and potash, and Thomas' phosphate. In some cases the other manures have made a slight improvement, but often they have not. Several of the farmers report that the three plots above-mentioned are grazed much closer than the rest of the paddock, the superphosphate plot especially so. Mention is also made of the accumulation of the droppings from the cows on this plot. While the improvement of the native grasses has thus, to some extent, been accomplished, we have not had much success in establishing the clovers. Probably this is largely due to the unfavorable season. In cases, however, we have had marked success, especially with trefoil, cow grass, and white clover. For instance, on the field on the Salvation Army Farm, at Bayswater, on poor stringy-bark scrub country, the clovers are reported to be forming good large patches, which are spreading in such a way that the prospects of ultimate success are very good. I was led to try the effect of the clovers from the results of experiments in Europe and America, where it appears to have been proven that once this class of plants is well established, they not only improve the quality of the soil, but the ordinary grasses are able to follow them up and gradually form a good mixed pasture. As the work with these fields is being continued this year, I hope to have more definite results to present before you at the next Convention.

Before leaving the question of top-dressing for pastures, I may say that the general opinion among farmers seems to be divided between the value of superphosphate, bonedust, and lime. As bonedust contains about 20 per cent. of phosphoric acid, it will unquestionably have a good effect. Whether its supposed influence in lasting over several years, and in this respect being superior to the more soluble forms of phosphates, has any definite basis in fact, is a question that I hope we will be able to answer definitely in another year or two. Meanwhile, it is interesting to be able to quote a number of cases in which the application of superphosphate has steadily improved the condition of grazing land. For instance, Mr. Young, of Drouin, has a small paddock at the back of the town which has been dressed with superphosphate, at the rate of 1 cwt. per acre, for the last eight years. This four-acre plot carries four cows all the year round except for three months in winter, when a little chaff is fed in addition to the grass. Its capacity may, therefore, be stated at a cow to $1\frac{1}{4}$ acres. The surrounding land, cleared and sown with cocksfoot rye grass and clover about the same number of years ago, is carrying a cow to five or six acres. The deep, dark green of the one, compared with the lighter appearance of the others, may be seen a mile off. On walking across the adjoining properties, the usual Gippsland pasture, with here and there small, bare patches, is seen, contrasting strongly with the dense, thick sward on Mr. Young's paddock.

Reference has been made already to the fact that large herds mean rich pastures. In fact, the animal is an essential factor in increasing the stock-carrying capacity of any farm. The animal concentrates the phos-

phates on the surface, where they are within reach of the roots of the herbage. The solid and liquid excreta from each 1,000 lbs. live-weight of stock will, on the average, contain phosphates to the value of about £1 per annum. The richer the food, the more valuable will be the manure, but under our present conditions, and at current market rates, this estimate is probably well within the mark. Then, again, continuous grazing compels the plants to bring up more phosphates from the deeper portions of the land, and so increases the fertility of the surface soil. But there is another very important point about the solid manure of live stock. Large numbers of seeds pass through the alimentary canal without being digested; hence we find that, in the case of small seeds, such as clovers, this method is the chief way by which they are spread. This remark applies particularly to land with a hard, dry surface. The seed not only germinates readily in the dung, but it finds a good food supply at hand, and the soil immediately beneath is generally moist, so that the roots are able to penetrate the soil more easily. The fact that cattle and horses will not readily graze such patches for several months gives the young plants a better chance to establish themselves. Farmers who have been feeding meadow hay for a number of years know the importance of this factor in the improvement of pastures. In view of the difficulty of getting a good stand in even two or three seasons, and the expense attached to laying down grass land, my colleague, Mr. Cameron, suggests that it will be worth while feeding, for experimental purposes, a quantity of clover seed to cows, to see if the percentage that germinated in the dung is sufficient to pay for the cost of the seed.

Turning now from the natural pastures to the conditions that prevail on most Victorian farms, we are struck by the fact that since 1875 our live stock has, on the whole, increased, while during the same period four million acres of our best land have been brought under the plough. After making all deductions for the extension of ringbarking and clearing the forest, which marked the first work of the selectors, there can be no doubt that, acre for acre, we are carrying more live stock now than ever before, and I think there is evidence that the pastures in many districts are improving. The most noticeable improvement in the number of live stock, however, is in the wheat-growing areas, and this increase is due to the combination of cultivation and grazing. Without the breaking up of the land, the grazing would not be available. With the advent of the lamb trade many northern farms, of from 320 to 640 acres in area, are approximating to a rotation system. Wheat, oats, grazing, with a bare or a rape fallow, is the order in the most progressive districts. While the influence of superphosphate in making such a rotation possible must not be overlooked, still, what I wish to call attention to is this fact: It is the cultivation of the land that enables the seed to germinate readily, and which thus secures the additional grazing area already referred to. No such improvement is found on the northern areas, where the land has not been broken up. Here the stock-carrying capacity has undoubtedly improved, but not to the same extent as where the farmer also grows wheat or oats. The cultivated land allows of the speedy germination, not only of the wild oats and self-sown, but also of the trefoil and other plants that seem to come up spontaneously in the stubble. The growth of rape for sheep is another instance in point. Not only does this crop furnish food direct for the sheep, but it enriches the soil, because it helps, through the medium of the sheep manure, to transfer the phosphates and other elements of

fertility from the subsoil to the surface. Furthermore, the additional humus helps to increase the water-holding capacity of the soil. On the whole, then, it will be seen that, by means of cultivation, the wheat farmer has already, to a great extent, solved the problem of improving his pastures. He is fast abandoning the natural grasses. His rotation system compensates for the low average rainfall—a rainfall too small to allow him to dispense with cultivation. He is in a different position from the farmer in Gippsland and the Western District. The exigencies of the climate have forced him to adopt different methods, and, where seen at the best, those methods mark a distinct advance in Victorian agriculture.

Whether it will be possible, or even profitable, for the northern farmer to lay down land to permanent pasture is a question which has not yet been solved. At present lucerne appears to offer the best solution of the difficulty. When once established, its deep roots make it less dependent on the rainfall than most plants. It yields large quantities of fodder, very rich in the most valuable part of the food constituents, namely, the flesh-formers. When sown with superphosphate, and in a favorable year, it is more easily grown in the north than to the south of the Divide. Undoubtedly, it will form one of the mainstays of the irrigation settlements. Its weak points are that it does not stand grazing well, and that it goes asleep in the winter. Some farmers, however, obtain very much better results from lucerne grown without irrigation than others. My own opinion is that lucerne should be grown for hay each season, to allow it to bloom, and thus insure deep penetration of the roots. When grazed, lucerne should be heavily stocked for a few weeks, and then given a complete rest to allow the plants to make fresh growth. The first growth in spring is usually mixed with large quantities of other herbage, and should be made into hay or silage during the month of November. There is then sufficient moisture in the ground to insure a good, clean growth of almost pure lucerne, which should be allowed to grow until it is beginning to bloom. The paddocks should then be fairly heavily stocked during the summer, so that it is quite bare again at the time of the first autumn rains. If the animals have left any considerable amount of hard stalks destitute of leaves, it is a good plan to run a mowing machine over the whole paddock, allowing the stalks to remain on the ground. With the first autumn rains an abundant growth will then start from the crowns, and a clean-cut crown starts more effectively than one which has been bruised and injured by the teeth of the animal. The marvellous growth which lucerne makes in the spring and autumn is sufficient to justify its adoption by every progressive farmer. Lucerne is now being grown without the aid of irrigation in many parts of the north, where formerly it was considered impracticable to get a stand, and especially on sandy soils. There seems to be no reason why lucerne should not be profitably grown even in districts with the lowest annual rainfall. The difficulty often found in establishing a crop might be overcome by careful preparation of the seed bed, by planting the seed almost on the surface of the land, and by the use of superphosphates. The crop may be kept progressively improving in condition by scarifying it once a year, and by the application of at least ½ cwt. superphosphate to the acre. Whether prairie grass may be profitably combined with it, so as to insure good growth during the winter months, is a matter that requires further investigation.

So long as farms are as large in area as at present, it may be argued that crop, grazing, and fallow form the most practical solution of the pro-

blem. If such prove to be the case, it simply means that the natural pastures are doomed to speedy extinction in the north, for the sooner a rotation is adopted, that only allows of one or two years' grazing, the sooner the land will be turned to its most profitable use. A somewhat similar system of rotation is seen in the dairy farms at Koroit, where potatoes, oats, barley, and peas are worked into a scheme that usually provides for three years' grazing or more, according to the size of the farm. In Gippsland, the preliminary work has not yet advanced to an extent comparable with the Western district, but indications point to the fact that the best way to keep the steep hills in good grazing condition is by the application of superphosphate. The spread of clovers (and in wet places the strawberry clover is making rapid headway) augurs well for the permanence of our pastures in districts where lucerne cannot be grown. The three factors, live stock, cultivation, and superphosphates, all tend to the rapid improvement of the Victorian pastures.

II. SOME LAW.

J. Weldon Power, Horsham.

The practice of lecturers of introducing the subject of the lecture by prefatory remarks descriptive of its general character, and of the various sides it may present for observation, is so general as almost to amount to a law in itself. Being a lawyer, I feel I ought not to fly in the face of precedent. Law, however, is so huge a subject that if I were to start with a preface the time available for my paper would be exhausted long before I could get through. Therefore I have entitled my paper "Some Law," so that I may evade the preface and get down to business right away. My reason for offering this paper is that farmers run up against law in their everyday affairs just as often as most people, and it occurs to me that a few hints on how to get through with some of the matters of business that farmers have to deal with now and then would be of material use to them.

At our conventions I have, from time to time, listened to most admirable papers suggesting means and devices for increasing the productiveness of land and stock. A hint how to make a cow that yields a profit of £9 bring up that profit to £10 is worth knowing. Now, it is a very small piece of litigation indeed that will not run, not only to £1, and the whole £10, too, but to a fair slice of the whole herd. A man is sometimes faced with the proposition, "Must I go to law over it, or had I better put the loss and annoyance in my pocket and grin and bear it?" The loss may be that of a good bargain over a well-bought piece of land, a loss worth many cows, and a man must make up his mind to make the loss or face the risk. The unscrupulous man knows this, and, relying on the horror the average saving man with money to lose has of law, he swindles him out of his rights, and then only thinks and openly boasts many times that he is only showing "savee" how to get on. If I can give you a hint or two how to be ready for that sort of customer, it may prove worth a cow or two, perhaps.

It may be that farmers in other parts of the State know more than litigation in the Wimmera district shows me that farmers know there, and

I may, as far as this paper is concerned, be, so to speak, "teaching my grandmother how to suck eggs"; but I do not think it likely, so I will get along. I do not propose to teach you any law, nor do I address this paper to lawyers. I do not wish you to understand that what I say covers all the ground on the points under discussion. Particularly, I do not want you to assume that you can go to law right away if any matter you have worrying you seems to fall within the few rules I will mention. I want you to understand that I am only giving you hints about the law upon, and the way to go to work to carry through, the classes of transactions I will refer to. I will only say this much: if you keep what I say in mind, and stick to it, you will pull through your future transactions of these classes with satisfaction to yourselves and a minimum of risk and loss.

To begin with deals and bargains with your neighbours. There are some bargains that must be in writing, and be signed by the other party, if you wish to hold that other party to his word—and just in the same way such a bargain must be signed by you if the other party wishes to hold you to it. If he signs and you do not, you can hold him, though he cannot hold you; and if you sign and he does not, he can hold you, but you cannot hold him. This may seem unfair and one-sided; but if the law be that this class of bargain must be in writing, and be signed, it is your own fault that you omit to get the writing and his signature. And it is his fault if he does not look after himself. Remember, however, you cannot in such a case eat your cake and have it. If he sets out to hold you to it, he must stand by it himself. The only thing is, if you have not the writing with his signature to it, he can tell you when you call on him to go ahead, that he has changed his mind, and that is all there is to it. You have no redress. Of this class of bargain is every bargain relating to land or interests in land.

As far back as the days of Charles II., of merry memory, the well-known Statute of Frauds was passed for the purpose, as the Statute itself says, of "the prevention of many fraudulent practices which are commonly endeavoured to be upheld by perjury and subornation of perjury." One of its provisions was in effect that you could not enforce by action at law a bargain to buy or sell land unless the terms of the bargain were written out, and bore the signature of the party to be held to it. The particular evil that seems to have been aimed at was the practice of going to court to prove false word-of-mouth bargains for sale or purchase of land, and buying witnesses to forswear themselves, and swear to the truth of the alleged bargain. This was, no doubt, a nice state of things, and shows that some of our forbears were pretty unscrupulous operators in the land booming of those days. There was a rough and ready simplicity and directness about their methods. Get a man to talk about his land, and then palm off an alleged bargain on the Court, and buy half-a-dozen or a score of professional witnesses to swear up to the hilt. You see the scoop to be made enabled the operator to buy the aid of the witnesses. Land was then, as now, a valuable thing, and it was the very fact of its value, and the profit that could be made, that suggested the operation, and provided the means of carrying it out.

The Statute required the bargain to be in writing, and the signature to it of the party that is to be held. A common idea is that to bind a sale of land there must be a deposit of money or money's worth, such as a cheque, and that if there be such a deposit the bargain is binding, whether there be writing or not. No, the deposit has nothing to do with the

binding. The net effect of the act is that if a vendor agreed with a purchaser to sell a piece of land, and took deposit of half the purchase money, and there were fifty people present to swear to the bargain and to the payment of the deposit, and there was no writing signed by the vendor, the vendor may return the money, and refuse to go on with the deal. It does not even matter if, in the presence of the fifty witnesses, the purchaser paid not only a deposit, but the whole of the purchase money—paid it in bank notes, say, and every one of the fifty witnesses kept tally of the numbers of the notes, and the general manager of the bank came to swear the purchaser himself paid those very notes in to his account—it would be no use. The vendor could decline the deal, and stick to his land by returning the money. You see, it is not a question of proving what the bargain was. The fifty witnesses could do that. It is not a question of the effect of paying a deposit, or paying the purchase money. That cuts no ice.

The matter stands this way, that to put a stop to the outrageous swindling and false swearing that used to go on where word-of-mouth bargains were permitted with such a valuable thing as land, a law was passed declaring that the help of the law courts will not be given to enforce bargains relating to land unless the bargain be in writing. The reason is twofold—first, because to go through the formality of writing out the terms of the bargain and signing it shows that the party who signed really agreed to the conditions; and, next, because the writing tells the story of the bargain, and cuts down ground for dispute and misunderstanding. No doubt it appeared to a certain class in those days as much an interference with the liberty of the subject to come in with a law of that kind as it does to certain persons to-day when a law is introduced to prevent milled butter being put on the market with a fancy factory brand, all beautified with buttercups and daisies and copper churns, till the purchaser can almost see the fairy factory set in the choicest flats of the Gippsland rivers, instead of being stuck away in a back slum of a filthy suburb. The underlying motive is the same—to stop swindling; and the good sense of the people as a whole accepted it.

I must now call a halt to say that there is an exception to the rule that the bargain must be in writing, with which I will deal later, and to give some hints about the writing.

The first principle about a written bargain is that once it is written out and signed no explanation or excuses will, generally speaking, be accepted. The writing stands, and neither party may go outside it to give evidence in the box that this, that, or the other, not set out in the writing, was promised or understood at the time. There are several exceptions to this rule, but take it as safe and reliable advice from me that if there be any promise or so-called "understanding" about the deal, get that promise or understanding into the writing over the other fellow's signature, if you want to rely on it. For instance, you go to a man to buy a farm, and find him on the boundary supervising a contract for putting up a wire netting vermin-proof fence along a 2-mile boundary, with the netting and new posts and wire all along the line, and they are just pulling an old brush fence out of the way. He says he will have it completed in three weeks. You offer him £10 an acre, and he replies, "Why, the new vermin fence that I will have finished in three weeks will put another 5s. an acre on the land." You say, "Oh, well, I'll give you another 2s. 6d.," and you finally close at £10 4s. If you do not put in the writing that

the fence is to be completed by him you are up a wattle, and you cannot even make him put back as much of the old brush fence as he may have pulled off the line to make way for the fence you really gave him the extra 4s. an acre for. If on top of that bargain you go and sell your own farm to enable you to complete your deal with him, you are only deeper in the mire. The safest way to go into a deal where there is writing is to regard it as though you gave up or gave away everything you asked the other man to do, everything he told you was good or advantageous about it, and which he told you he would do if you bought, which you do not get into the writing itself. For instance, if you had fifty people to swear that he promised you if you could not pay an instalment he would hold it over for twelve months it will avail you nothing. It is not in the writing, and you cannot go outside that. If you bargained that you would be at liberty to cancel the deal within one month by paying a forfeit of £100, and you had a dozen justices of the peace to swear that he promised to declare the deal off on those terms—but it is not so set out in the writing: —no good. Neither you nor the witnesses will be allowed to give that evidence. You must stand or fall by the writing. The reason is simple: What is the good of the writing if a man be allowed to supplement it or contradict it by word of mouth? You might as well have it all by word of mouth. The common mistake is that people think the courts may listen to evidence to prove what was really promised, or, as the usual phrase goes, "was understood at the time." No; the law will only allow the courts to look at the writing.

This same rule as to writing in connexion with bargains in relation to land applies to all bargains when reduced into writing, whether relating to lands or chattels, to a greater or less extent; but the safe rule for laymen is to regard it as applying to all bargains in writing to the fullest extent. Particularly is it so regarding bargains in writing made with agents and canvassers. Every order you sign for an agent is a bargain in writing. You will find a canvasser ready to guarantee by word of mouth—and a wide mouth at that—that his plough will turn a 6-in. furrow through a metal road with a team of 14-hand ponies, and if you give it a trial you can return the implement right away if it does not give you complete satisfaction. Or perhaps it may be the case of a drill. He will guarantee—still with the wide mouth—that his firm's latest improved system of feed will break up and sow manure that has been lying for a fortnight on the open station platform—the railways not running to tarpaulins for manure these times—just as well as the best and driest conditioned superphosphates, and he will take the drill back if it won't, and you give him a signed order on that promise. You will find that the plough will not bury the weeds in a paddock that has been cropped for the past twenty years, and would burst up a team of traction engines to haul, or that the drill will not sow grain, let alone manure. No use, you are done. A smart canvasser and a farmer had business together, with the inevitable result. If you got the recording angel to come and testify that he was by and heard the agent promise and make a note of it at the time—no go. Neither you nor the angel will be allowed to give that evidence. The writing must tell the tale. What is not in the writing cuts no ice. Remember, whatever the canvasser says he will guarantee about the implement, whatever promises he makes about your having to be satisfied with it, get that in the order before you sign. If you stick to that rule there will be less orders signed and fewer disappointed agriculturists.

Don't be stalled off by the old bluff, "Do you doubt my word?" Why give him your signature and you put up with his word? Why, look at pretty well all the so-called orders you are asked to sign. You see that most of them from the better class of business people have printed on them in the margin a formal notice that the vendor will only be responsible for the warranty printed on the order. What do they put that there for? Honest people put it there as a warning to customers that the agent has no authority to guarantee or warrant anything not printed on the order. It was not long till the smart operator played over that game. He puts it on, knowing very well his agent will be smart enough to keep it out of sight of the purchaser, and then what a trump card it is as an answer to the poor purchaser's story that the agent gave the glowing guarantee that really got the order.

Look at everything you sign, back and front, and read it patiently, and when you do sign, sign close to what is written or printed, and get a duplicate of it to keep for yourself. You will want it nowadays. If the business won't stand that, have nothing to do with it. It shapes crooked from the moment the other man wants to take your signature, and will give you word of mouth only. So much for the writing.

Other classes of bargains that sometimes must be in writing and signed by the other man, if you want to hold him to them, are sales or purchases of goods and chattels of the value of £10 and upwards. Chattels mean all sorts of movable property, such as grain, hay, growing crops, live stock, produce, as well as articles of furniture and so on. Bargains about this class of property at £10 or more must present one or more of these three features if you want to hold the other man, viz.:—1st. They must be in writing, and be signed by him; 2nd, there must be payment, or payment of earnest money, even a penny, or less, if you can get it, will do; or 3rd, there must be delivery, though delivery may be of a portion in the name of the whole. For instance, if you want to buy a horse from a man, and shake hands in the presence of a dozen witnesses over the deal, at £15, and tell him you will come round in the morning for the animal, and you do come round with the fifteen sovereigns, he may please himself whether he goes on with the business or tells you he has changed his mind. No one of the three things I have mentioned was present.

Suppose you want to sell a line of wheat for forward delivery, and you produce a fair sample of how it is going, and agree to sell to a man. He agrees to buy, and you close with each other, and you say you will start delivering that day fortnight. When the first load comes in he may please himself. If wheat has gone up you may find shuffling, or you may find an honest man. If you want to be sure to find the honest man, have one of those three things I have mentioned. Have writing; have delivery, which you can do by handing him a handful of the sample in the name of the whole line, or have him pay some earnest money. But delivery of that kind and payment of earnest money are not to be compared with writing. He may be dishonest enough to deny both, and unless you have witnesses you will get left. The writing is the simple way, and it sets out the price and the quality, and so on. And once more, get it all in the writing. If say, you are selling for forward delivery, and you think you will have between 900 and 1,000 bags, but are not sure, don't let him put in 1,000 bags; get it in as the crop to be harvested off such and such a paddock of so many acres. You may have a hailstorm before you get back. If your writing says about 1,000 bags, well, it has got to be "about" 1,000

bags; 900 won't do, and if the hailstorm leaves you only 500, and wheat goes up, you will have to face, not only the loss of your 500 bags, but will have to pay the advance in price of the short delivery.

As far as sales for forward delivery are concerned, I want to say this—If you want to guard against risk you must make the deal as of the crop growing on particular paddocks up to so many hundred bags. If you and the buyer have a talk, and you say, I reckon to get 2,000 bags this year, and I am willing to sell you now 1,500 bags for delivery in February, and he says all right, what you do nine times out of ten, is to sign a sale note to the buyer of about 1,500 bags of f.a.q., or, perhaps, prime shipping. Then you have to deliver "about" 1,500 bags, and it does not matter if the rust attacks the crop, and you don't get 1,500 bushels, you have simply agreed to sell him 1,500 bags, and though you had in your mind, and he knew it, the particular crop, yet that won't help you—it is not in the writing. When you sell a particular crop, specify the land on which it grows, then if disaster comes and destroys it, the bargain lapses at the wish of either. That is, the buyer need not pay, and he cannot force you to deliver. The basis of the bargain was that there should be a certain quality of crop to sell, and if Providence in this particular case takes a hand, then the crop that was contemplated does not come into existence at all.

About Sales of Stock.—Never take a man's word that an animal is sound and free from disease or vice. If you pay on his statement to that effect, and it is not in the sale note, you have no redress. Get it in the sale note as warranted sound, and so on. In these days, when inspectors are liable to come along, and order the destruction of animals, it is a wise thing when you buy a beast that may have come from suspected country, to stipulate that it is free from disease. It may not be worth while to bother, but if it be worth while to ask for his word, then it is good enough not to touch it if he won't put it in the sale note. Hold out for the word warranted. If you get the word warranted in, then all you have to do is to prove that the beast is not as warranted. If the word warranted be not there, then the chances are you will have to prove not only that it is unsound or diseased, but that he knew it was so.

Now to come back to bargains about land. For practical purposes the only exception to the rule that the bargain must be in writing is where you get or give possession under a word of mouth bargain or contract. This is called "part performance." In such a case the terms of the bargain may be proved any way you can, whether by writing or by witnesses in the box. Before touching on what you ought to look out for in the writing, I may say this about agents for sale:—Unless the agent holds the signed authority in writing of the vendor to sell or the purchaser to buy, he has now no power to bind the vendor or the purchaser. If an agent relies on the word-of-mouth instructions of a man to sell his land for him, and does sell it and signs the sale note, the vendor is not bound, and the purchaser cannot get the land if the vendor backs down. The purchaser's only remedy is to sue the agent for the loss of the bargain. I need not waste time telling the agents what to do. I am not flat enough to give a lecture to them. Therefore, if you deal with an agent, ask for his authority in writing if you want to make sure of the land.

Well, to come back to the contract. First of all, if you intend to have a solicitor to do what is called the "legal work" for you in connexion with

the matter, go to him before you sign anything. Be satisfied that the bargain you intend to make is fairly set out in the writing, and that none of the conditions is unfair. It will be too late after you have signed to object to the conditions. By far the most important service a solicitor can render to you in connexion with the matter is his advice as to the nature and effects of the document. If it be a sale by auction of one of these speculative private closer settlement estates, look out. You want to buy with freedom to sell again if you get tempted, and you want in your turn to have a title that won't frighten your man.

Stuck away in printed conditions may be a clause to the effect that no objection or requisition shall be made because of a certain mortgage further than to require that it be paid off when the balance of your purchase money falls due. You are thinking of going £15 an acre for the land, say, and you are told, "Oh, that clause is about a mortgage for only £25,000, equal to £5 per acre, and has five years to run, and the mortgagee won't hear of taking his money; £5 per acre of your purchase money is to remain outstanding till the due date of the mortgage, and then the mortgage will be paid off at the same time as you pay up." As you will still have to pay £5 an acre for your land, everything in the garden seems lovely, and you are satisfied. But it is bad business, and your title will be shied at you if you want to sell in your turn and your purchaser is cautious enough to have his contract seen to by his solicitor. The mortgage of £25,000 is not charged at per acre on the land. It is not £5 that is on every acre, but £25,000 is on every acre. That is, every inch of the land is responsible for the full loan. Your land will be the pick of it, no doubt. If the vendors get £15 an acre for half the land, and £5 an acre for the other half at the auction sale, it shows £50,000, good cover surely for a mortgage of £25,000, and things look satisfactory. But when the time for settlement comes the whole land stands for the loan. There are the 5,000 acres and the £25,000. If every purchaser pays up and the vendors are honest, there is enough to pay the mortgage. But suppose the vendors have been swindled by their manager, who has bolted with the cash. Suppose the land market falls a bit. That half that was bought for £5 when you bought your lot for £15 may now be worth only £4. Several purchasers may be unable to pay up. What will happen then? The mortgagee will sell the land, including yours, and you will get a dividend no doubt of more or less in the pound. That is not a fancy picture. It has happened before, and will happen again, and men supposed to be smarter than farmers have fallen in. Never buy a lot of land that is subject to a mortgage jointly with other land, unless there be a condition in the contract that the mortgagee will agree to the sale, and will give title on compliance by you with your payments under your contract. Let the vendor and the mortgagee arrange that between themselves. Let them trust one another.

Another thing, many people buy land on terms, and give promissory notes for the balance of the purchase money, and sometimes a transfer is signed to be held in trust till the purchase money be paid, but oftener not. Well, that is a bad system too. By far the safer way is to get the transfer right at once, and give a mortgage back. The purchaser is no worse off, but better off. The mortgage may sound bad, and you may feel freer without it, but it is safer and better and simpler than the other way. There are

several reasons for this. If you pay a good deposit, and are unable to see your speculation through, that deposit is invariably absolutely forfeited, if you are working under the promissory note system, and too often the vendor has under the contract the right to forfeit the purchase money paid to date. Then, if you fail, the vendor can stick to the land as well as the deposit, or he may slaughter the land to an accomplice, and turn round and sue you for the deficiency in price caused by his slaughtering sale. Moreover, you may have a difficulty in getting title at the finish. There are many ways in which you may be exposed to risks, not far-fetched either. If you get a transfer and give a mortgage, you eliminate all risks between you and your title except the one risk of whether you will be able to pay or not. You get the full benefit of your deposit. If you get hit later, the deposit cannot be forfeited against you. Moreover, if the mortgagee forecloses on the land, he cannot sue you for the mortgage money afterwards, and he cannot foreclose on the land if it be under the Transfer of Land Act, as nearly all country land is, unless he first offers the land for sale by public auction, fairly advertised, and if there be a surplus you get the benefit of it, which you would not the other way.

Another clause that is in almost every printed contract of sale is that forfeiture clause on default by purchaser. You often see in contracts the conditions of Table A are to apply. Now, the forfeiture condition of this table is an iniquitous one, and I have often wondered that it was ever allowed into the Act. The conditions of Table A are intended for general use as being reasonably fair between buyer and seller. This condition, if a buyer makes default, enables the vendor, without any notice, to cancel the contract. This is most unfair, and no sensible man should sign it. Always have that clause amended to provide that the vendor cannot cancel without first giving you reasonable notice, say, fourteen days, to put yourself right. Another unfair condition of Table A is that enabling a vendor to annul the sale practically at his whim if you raise objection to his title, that he ought fairly to answer. This condition is often shamefully abused, and a vendor takes advantage of it to declare a sale off. Another is the condition that provides if the purchase money be not paid to the day the purchaser will pay 8 per cent. interest. First, the rate is criminally high, and next, the delay is caused as often as not by the vendor; yet the purchaser has to suffer. These things should be seen to.

About wills, the best thing I can tell you to do in this connexion is—Get your will made at once, and get a responsible solicitor to do it. The law makes in its own way a fair enough division if there be children—one-third to the widow, two-thirds to the children—but the expense of obtaining administration when a man dies without a will is much greater. There are two points about wills every one ought to know. First, when you marry there and then all wills made before marriage are instantly revoked and fall to the ground. Second, it is fairly well known that, generally speaking, a will is revoked by a later will without the new will saying anything about revoking. It is always so revoked, unless the scope of the later will clearly shows that it is supplementary to the first will. A common mistake is that if a man revokes a second will, as by cancelling his signature or tearing up or burning the second will, then the first will will operate. No, the first will was wiped out by the second, and does not revive. If you want to revive it you must re-execute it.

III.—THE ANALYSIS OF SOILS AND MANURES: THEIR UTILITY TO THE FARMER.

F. E. Lee, Agricultural Superintendent.

Among the many benefits that science has rendered to the farmer, there is perhaps not one which has a more important and practical everyday application than the analysis of soils and manures. The value, however, of soil analysis is sometimes exaggerated by the agriculturist, who sees in the statement that his soil contains so much percentage of the various plant foods the possible solution of many of the difficulties he experiences in producing maximum crops. That the chemical composition of the soil, and also of all the vegetable products derived from it is of the very highest value as a guide is not denied, but until the farmer realizes that "fertility" means something more than the mere presence of plant food in a soil the best results and maximum amount of assistance cannot be gained by the medium of soil analysis.

In the true sense of the term, the fertility or in other words the productive power of a soil represents the harmonious working together of a number of factors, all of which are interdependent. All vegetable life, whether cultivated crops, grass, or forest trees, must breathe. The same life depends on the store of moisture at the disposal of the plant. The temperature of the soil exercises a highly important influence on vegetable life, and at no period is this factor more observable than during the germination of the seed. The penetration of the roots of all plants depends on the measure of resistance that is offered by the soil. The effect of shallow cultivation or of cultivation conducted always to the same depth is responsible to a great extent for the confinement of the roots within a limited sphere. Lack of opportunity to expand and elaborate an abundant root system will be found to be as often the cause of poor crops as the absence of plant food.

A proper system of drainage, either natural or artificial, is by no means the least of the factors which influence production. The removal of surplus water by drainage permits of the circulation of air and thus tends to improve the warmth of the soil. In a badly drained or waterlogged soil, the surplus moisture can only be removed by surface evaporation, and as this means is only slow, it is not surprising that farmers find crops grown on wet soils slow to respond to the genial climatic conditions of spring.

The presence of plant foods in the soil contributes to the well-being of the crops grown upon it, but it is nevertheless a well-established fact that all the elements of plant food may be present, and yet the soil may be quite unproductive. How can this be? The answer is quite simple, and examples in support of this statement may be found in many parts of Victoria. The proper conditions of drainage, air, warmth, &c., are absent, and the inharmonious working of these controlling factors of fertility prevent such soils being profitably cultivated. It is only necessary to call to mind the large tracts of land in the State which are lying unproductive to-day, owing to the imperfect conditions of drainage which prevent anything but a growth of coarse sword grass, reeds, or

grass tree. Take, for instance, the land in the Heytesbury Forest area, familiar to many of those present, as a barren, worthless tract of country. Yet the analyses of three representative samples of soil from that locality show it to contain, if anything, slightly over the average content of nitrogen—for the coastal plain districts; it is low in phosphoric acid, and particularly poor in potash, but considered purely from a chemical point of view, the Heytesbury Forest land should be as productive as many other districts. Why then is this land unproductive? The whole question may be succinctly answered in two words—"bad drainage." Here, then, is an example of where a chemical analysis only is misleading if sole reliance were to be placed upon such means to determine the producing power of a soil. Let us turn for another example to the Mallee soils in this State: we find, by chemical analyses of these soils, that they are comparatively low in nitrogen, poor in phosphoric acid, rich in potash, and superabundantly supplied with lime. From a purely chemical stand-point, the Mallee soils appear ill-balanced in plant foods, and there would be every justification for an inexperienced agricultural chemist to recommend the addition of manures containing nitrogen to the usual phosphatic dressing. It is to the experimental field work that the northern farmer owes the convincing demonstration that the addition of nitrogenous fertilizers not only increases the cost of application, but may even lower the yield of grain.

THE STANDARD OF A SOIL OF GOOD FERTILITY.

Soils.		Analyses.	Parts in 100,000 of Soil.				
			Nitrogen.	Phosphoric Acid.	Potash.	Lime.	Chlorine.
			200	150	250	400	Not more than 35.
Top Soil—							
Northern Plains	...	34	112	61	422	1,072	9
Coastal Plain...	...	85	178	61	185	903	7
Mallee ...	..	5	113	47	380	2,426	7
Volcanic Soils	...	24	272	61	277	588	17
Clay Soils ...	...	30	149	63	205	176	10
Drained Swamps	..	8	750	76	263	315	40
Sub-Soil—							
Northern Plains	...	34	89	60	706	2,487	20
Coastal Plain...	...	85	106	46	247	380	13
Volcanic Soils	...	24	103	42	170	1,649	6
Clay Soils ...	...	30	100	66	232	155	8
Drained Swamps	...	8	191	31	154	121	19

Many instances may be quoted of where a purely chemical analysis of soil is as likely to be misleading as not. My hearers will begin to ask themselves, have they, after all, been living in a fool's paradise in placing this implicit confidence in soil analysis? My answer is—Not at all. Soil analysis has played and always will play a highly important part in agricultural affairs, but the solid fact must be grasped by all agriculturists that the presence of plant foods is only one of the factors which control production—an important one, and a fundamental one, but nevertheless not the only one. There is, however, one aspect

of the question of soil analysis that has been patent to the expert officers of the Agricultural Department for many years, and it is this:—The standard which we have adopted for the purpose of comparing the analyses of Victorian soils with others is an arbitrary one which requires modification for localities having different climatic conditions. A comprehensive soil survey of the whole State would involve enormous expenditure, and would engage the exclusive attention of a large staff of trained analysts for many years to come. In my opinion what would be of immediate benefit would be the commencing of a regular and systematic collection of every type of soil within the boundaries of the Wimmera, Mallee, Goulburn Valley, North-Eastern, Central, Western, and Gippsland districts. Land-holders could be invited to lend assistance to the Department in procuring representative types, and a uniform plan for the taking of samples could easily be devised. It might be asked—what is this but a soil survey? Of course, it is a soil survey to a certain extent, but instead of land-owners being compelled to wait, perhaps a decade or more, for information, the want of which is urgently felt at the present moment, some definite information would be revealed within a reasonable time, and at a fairly moderate cost. What we want, in my opinion, is something akin to the Bureau of Soils, which is a well-defined branch in the United States Department of Agriculture. Time will not permit me to go minutely into the details of the suggestion, but I may be permitted to say that until some amendment is made in our present system of soil analysis, much of the valuable work that is being done in that direction will be wasted for lack of uniformity, and may have to be done over again. I respectfully commend the suggestion to the Chamber of Agriculture, confident that the knowledge of the important principles involved and the practical utility of such work will be sufficient to insure its thorough investigation.

THE ANALYSIS OF MANURES.

So widespread has the use of artificial manures become within the last few years, that it is not surprising to find a much better appreciation of the value of the chemical composition of these aids to production than prevailed a few years ago. The competition for the farmers' favour has had the effect of keeping up and even improving the quality of artificial manures every year. Vendors of an article containing a high content of plant foods are quick to draw attention to the chemical composition and commercial value of the article supplied by a rival firm—if inferior to their own. The necessity for the presence of a label setting out the analysis of the contents on every bag of manure sold, under the provisions of the Artificial Manures Act, has done much to impress the farmer, and incidentally to educate him in the direction of the chemical compostiton of manures. Nowadays the purchaser of artificial manures has only to refer to the published list of sworn quality, price asked, and real value, for every fertilizer vended in the State, which is to be found in the *Journal* of the Department of Agriculture. From time to time there are also published in the same *Journal* the analyses of manure samples, taken by officers of the Department, in the country, during transit, or on the farm. These safeguards assure the protection of the purchaser from a spurious or adulterated article. There is nothing to

the provisions of the Manures Act to prevent manufacturers of manures asking whatever price they may think fit, but the question of judgment as to what is the real value is made simple by the establishment of unit values, which fix the prices for 1 per cent. of the three principal plant foods for the ensuing twelve months.

Notwithstanding the frequency with which departmental officers lecture on the valuation of manures, there still exists, I regret to say, only a hazy notion in the minds of many purchasers of manures how to apply the simple rules laid down for the calculation of the commercial values of these substances. It is only necessary to refer to the list of artificial manures sold in Victoria to find that between the price per ton asked, and the "real value" per ton, there is often a wide margin. I take it that every person, whether buying manures or any other article, wishes to get as good value for his money as possible, and yet we are confronted with the fact that very many farmers spend in the aggregate enormous sums of money every year in the purchase of substances that they practically know nothing whatever about. I do not suggest for one moment that fraud of any kind is attempted, but it must be admitted by every unprejudiced mind, that while such a state of things prevails, many purchasers of manures are not protected as they should be by their own knowledge and judgment. What remedy is to be suggested to protect the purchaser? The only effective remedy will be to make every farmer conversant with the provisions of the Manures Act, and to explain by means of a series of vigorous lectures in country districts the simple method by which every purchaser can ascertain the real money value of manures before ordering them. How often do we hear the statement made that such and such a manure was no good, and that it would not be used again. The ordinary rules of common sense tell us that it would be better to know beforehand than after the manure is put in the ground if it is worth the money paid for it or not.

In conclusion, gentlemen, I may be permitted to say that the best protection a farmer has is his own knowledge, and while it is too much to expect farmers of mature years to take up the study of agricultural science, there should be a better appreciation of the advantages to be gained by listening to these matters discussed on the lecture platform. The Department of Agriculture is not only willing but anxious to help those who wish to help themselves, and this can be brought about in no better way than by means of personal contact with those officers who have made these matters their especial study.

IV.—BEES.

R. Beuhne, President Victorian Apiarists' Association.

Being aware that probably few of you are beekeepers, as the term is now generally understood, I shall deal with my subject more in a general, and, I trust, useful, way than if I were addressing specialist beekeepers.

Bees are wonderful insects, as everybody admits. The researches of scientists and the observations of expert apiarists, whose daily work is amongst bees, have, however, cleared up much that was mysterious about

the beehive. The queen, usually supposed to be an autocrat, is in reality the mother, and the hardest worked inmate of the hive, her work being that of laying the eggs which produce the future generations of the colony. When at her best, a queen will lay up to 2,000 eggs a day. Should the queen, on account of old age or from some other cause, fail to produce the number required to maintain the strength of the hive, the workers will proceed to raise a young queen, who in turn will kill her mother, and then the remains of her late majesty are thrown outside without ceremony. This apparent callousness is but one of nature's provisions for preventing the extinction of the species. If the queen were left to die of old age this might occur during winter, a time when a new mother of the colony could not be raised, and as the queen is the only female capable of reproducing the species, the colony would become extinct.

The average life of a queen is two years, and that of worker bees only thirty-five days. Therefore, if the rate of reproduction is not equal to the death-rate, the chance of a surplus of honey, upon which the apiarist depends for his living, disappears entirely. When birth-rate and death-rate are equal, then the colony will continue to exist; that, however, is insufficient, for bees are not kept for amusement like canaries, but for profit. This is obtainable only when the rate of reproduction during the time preceding the honey flow is greatly in excess of the death-rate, so that a vast surplus over and above what is required by the bees themselves may be gathered while there are blossoms from which to collect it.

The ability of the apiarist to practise selection in breeding, and to replace queens as soon as they are past their prime, constitutes the chief advantage of modern bee culture over the former leave-alone method of keeping bees in common boxes. The substitution of a painted and ornamental modern hive for the ordinary gin, kerosene, or soap box is of little advantage unless the best methods of management are practised as well.

Many of you will doubtless know that years ago bees were much more plentiful and much more profitable when kept in box hives than they are to-day. The reasons are that diseases did not visit them, and that the natural flora from which bees gather nectar was much more plentiful than it is now. When the disease known as foul-brood made its appearance, bee-keepers, such as they were then, and bee-hunters unconsciously greatly assisted the spread of disease by carelessly leaving exposed, or purposely exposing, combs unfit to put into the straining-bag, the idea being to let the bees collect, and thus save the honey contained in such combs. When disease germs were present in the honey, infection was not only at once re-introduced into the colony just robbed, but was also spread to all hives far and near which gathered the honey from these combs. In their own interest, as well as that of others, I would advise all who still keep box hives, never to let bees have access to any honey, honeycomb, wax, or refuse. Quite apart from the spreading of disease, the getting of honey by bees in this unusual and unnatural way, causes robbing habits and viciousness.

Of the many things with which bees are credited, one is that they know their master. This has no foundation in fact, for the man who can handle his bees without being stung can also handle bees other than his own in just the same way. It is often asked, how is it that bees will sting one person and not another? In answer, I may state that, in this respect, as well as in many other things, bees are guided by odour. Every person or animal has his individual odour. The dog tracking his master by scent

is a good proof of it. The odour of some persons, animals, or things is more objectionable to bees than that of others, hence the difference of bees in their attitude towards them. Amongst the odours that are very objectionable to bees are those of kerosene, camphor, eucalyptus oil, toilet perfumes, ants, raw meat, and similar materials. None of these should be handled by any one working amonst bees. Washing your hands ever so much will not entirely remove the odour for at least some hours.

Bees, when filled with honey, are much less inclined to sting than when empty. This explains the reason of the use of smoke, which causes them to fill themselves with honey, and thus makes them more harmless. A swarm which has just come out of the hive is rarely inclined to sting, whereas one which has been out many hours, or comes from an empty hive, is usually wicked.

It is impossible to deal with many things that I should have liked to within the space of a short paper, but I hope that, if it does nothing more, it will, on occasions, save you some painful sensations.

The Convention Papers will be continued in the September number of the Journal.

A GOOD COW.

That there are good cows in Victoria is evidenced from time to time, and occasionally very high returns are secured. A few days ago it was reported that Mr. Hall, manager of Mr. Cumming's property at Yarragon, had a particularly good cow. Mr. Herkes, of the Agricultural Department, was instructed to officially check her record, and he reports that she is a three-quarter Jersey breed, nine years old, named "Doris." She is by a Jersey bull, and her dam was from an Ayrshire cow by a Jersey bull.

This cow has had seven calves, and has been milking continuously for the last four years, milking each season on to the point of calving. It may be mentioned that after her first calf she milked for fourteen months, and was not a great producer till the fourth calving. She calved on the 15th March last, and was reported as capable of making 28 lbs. of butter per week. Mr. Herkes found her yield to weigh 29 lbs. and 28 lbs. for evening and morning respectively, with the same test of 4.5 for each, making the butter return for the day come up to 2.77 lbs. of butter, or at the rate of nearly 19½ lbs. for the week. When it is considered that the cow, when tested, had calved 3½ months previously, and that the test was made at the worst time of the year—in the depth of winter—the result must be regarded as highly creditable. A photograph of the cow is reproduced on the front cover of this journal.

R. C.

SCIENTIFIC INSTRUCTION IN DAIRYING.

R. Crowe, Superintendent of Exports.

In 1888, when the earliest butter factories commenced operations, the methods and applications used for butter-making were crude as compared with those of the present day. At the Centennial International Exhibition the late Mr. David Wilson gave instruction in Modern Dairying, and in the use of modern appliances, chief amongst which were the cream separator, power churn, and butter-worker.

There were no pasteurizers, coolers, refrigerators, Babcock testers, acidity or curd tests, &c., in those days, and the butter factory managers had little or no knowledge of dairy chemistry or bacteriology; they had to be full of resource and watchfulness in order to prevent wastes and make a good article.

A travelling dairy was sent round the country by the Government, and cheese instructors were also engaged. Then later on Mr. Potts held classes in various centres, and Dr. Cherry gave instruction in dairy bacteriology, &c., at the University.

STUDENTS VISITING WILLSMERE PARK DAIRY.

The Butter Factory Managers' Association was formed in 1894, and this mutual improvement association provided the means for butter factory managers to keep themselves abreast of the times. This year's conference was coupled with a course of instruction given by the Department of Agriculture at the University. Forty-two managers attended the course, which was of a scientific and practical nature, extending over a fortnight. Instruction in dairy bacteriology was given daily by Dr. Bull, and each afternoon practical instruction in milk, cream, and butter testing by departmental officers. Visits to dairies, freezing works, abattoirs, and ocean steamers were carried out, when demonstrations on cleanliness, refrigeration, and ailments of dairy stock were afforded the students. Six evening lectures were also given at the University. Afterwards the course was continued at the Cobden Butter Factory, where a fortnight's instruction was given in practical butter factory management. By no means the least interesting and valuable part of the proceedings was secured in visiting the Tandarook and Cobrico Cheese Factories, and the Camperdown, Grasmere, Colac, and Cororooke Butter Factories. Messrs. Archer and Herkes were in charge of the class during the whole of the country session.

The whole course was much appreciated by those who took part, and it goes without saying that, as the result, each and every one of them will show the benefit in their future practice.

STATISTICS.

Rainfall in Victoria.

SECOND QUARTER, 1906.

TABLE showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with corresponding monthly and quarterly averages for each Basin deduced from all available records to date.

Basin.	April.		May.		June.		Total for Second Quarter, 1906.	Average for Second Quarter.
	Amount, 1906.	Average.	Amount, 1906.	Average.	Amount, 1906. *	Average.	*	
Glenelg and Wannon Rivers	1.16	2.33	4.05	2.56	4.42	3.64	9.63	8.53
Fitzroy, Eumerella, and Merri Rivers	1.81	2.52	3.38	3.15	4.72	3.86	9.91	9.51
Hopkins River and Mount Emu Creek	1.19	2.37	3.38	2.45	3.88	3.23	8.45	8.05
Mount Elephant and Lake Corangamite	1.20	2.19	3.60	2.33	3.16	2.95	7.96	7.47
Otway Forest	2.85	3.64	4.51	4.51	4.25	5.09	11.61	13.24
Moorabool and Barwon Rivers	0.88	2.35	3.03	2.55	3.10	2.85	7.01	7.75
Werribee and Saltwater Rivers	0.66	2.41	2.29	2.56	1.77	3.05	4.72	8.02
Yarra River and Dandenong Creek	1.67	3.15	3.72	3.33	4.12	3.67	9.51	10.15
Koo-wee-rup Swamp ...	1.99	3.41	3.57	3.73	4.04	3.81	9.60	10.95
South Gippsland	3.25	3.61	2.55	3.71	2.97	4.56	8.77	11.88
La Trobe and Thomson Rivers	2.20	3.24	3.11	3.49	1.92	3.69	7.23	10.42
Macallister and Avon Rivers	0.70	2.86	1.62	2.10	0.81	2.46	3.13	7.42
Mitchell River	0.95	3.34	0.92	3.14	0.47	2.61	2.34	9.09
Tambo and Nicholson Rivers	0.89	3.01	1.05	2.70	0.86	2.71	2.80	8.42
Snowy River	0.57	4.04	1.21	3.14	1.08	4.45	2.86	11.63
Murray River	0.52	1.80	3.42	1.95	3.20	3.20	7.14	6.95
Mitta Mitta and Kiewa Rivers	1.77	2.38	4.55	3.13	5.00	5.29	11.32	10.80
Ovens River	1.38	3.04	4.90	3.54	5.33	6.36	11.61	12.93
Goulburn River	0.63	2.05	4.05	2.41	3.97	4.00	8.65	8.46
Campaspe River	0.34	2.12	4.89	2.66	4.70	3.69	9.93	8.47
Loddon River	0.22	1.73	3.80	1.87	3.96	2.78	7.98	6.38
Avon and Richardson Rivers	0.24	1.53	4.32	1.53	2.57	2.30	7.13	5.36
Avoca River	0.14	1.69	3.98	1.67	3.02	2.74	7.14	6.10
Western Wimmera	0.53	1.86	3.05	1.88	2.76	2.82	6.34	6.56
Eastern Wimmera	0.37	2.06	4.49	2.14	4.55	3.34	9.41	7.54
Mallee Country	0.13	1.27	3.27	1.22	2.15	2.37	5.55	4.86
The whole State	0.84	2.26	3.38	2.35	3.18	3.39	7.40	8.00

* Figures in these columns are subject to alterations when the complete number of returns for June has been received.

P. BARACCHI,
Government Astronomer.